SUMMARY

S.1 INTRODUCTION

This document is a site-specific environmental impact statement (EIS) for construction and operation of a proposed depleted uranium hexafluoride (DUF_6) conversion facility at the U.S. Department of Energy (DOE) Portsmouth site in Ohio (Figure S-1). The proposed facility would convert the DUF_6 stored at Portsmouth to a more stable chemical form suitable for use or disposal. The facility would also convert the DUF_6 from the East Tennessee Technology Park (ETTP) site near Oak Ridge, Tennessee. In a Notice of Intent (NOI) published in the *Federal Register* on September 18, 2001 (*Federal Register*, Volume 66, page 48123 [66 FR 48123]), DOE announced its intention to prepare a single EIS for a proposal to construct, operate, maintain, and decontaminate and decommission two DUF_6 conversion facilities at Portsmouth, Ohio, and Paducah, Kentucky, in accordance with the National Environmental Policy Act of 1969 (NEPA) (*United States Code*, Title 42, Section 4321 et seq. [42 USC 4321 et seq.]) and DOE's NEPA implementing procedures (*Code of Federal Regulation*s, Title 10, Part 1021 [10 CFR Part 1021]). Subsequent to award of a contract to Uranium Disposition Services, LLC (hereafter referred to as UDS), Oak Ridge, Tennessee, on August 29, 2002, for design, construction, and operation of DUF_6 conversion facilities at Portsmouth and Paducah, DOE reevaluated its approach to the NEPA process and decided to prepare separate site-specific EISs. This change was announced in a *Federal Register* Notice of Change in NEPA Compliance Approach published on April 28, 2003 (68 FR 22368); the Notice is included as Attachment B to Appendix C of this EIS.

This EIS addresses the potential environmental impacts from the construction, operation, maintenance, and decontamination and decommissioning (D&D) of the proposed conversion facility at three alternative locations within the Portsmouth site; from the transportation of all ETTP cylinders (DUF_6, low-enriched UF_6 [LEU-UF_6], and empty) to Portsmouth; from the transportation of depleted uranium conversion products to a disposal facility; and from the transportation, sale, use, or disposal of the fluoride-containing conversion products (hydrogen fluoride [HF] or calcium fluoride [CaF_2]). An option of shipping the ETTP cylinders to Paducah is also considered. In addition, this EIS evaluates a no action alternative, which assumes continued storage of DUF_6 in cylinders at the Portsmouth and ETTP sites. A separate EIS (DOE/EIS-0359) evaluates potential environmental impacts for the proposed Paducah conversion facility.

S.1.1 Background Information

The current DUF_6 conversion facility project is the culmination of a long history of DUF_6 management activities and events. To put the current project into context and provide perspective, this section briefly discusses the origin and size of the DOE cylinder inventory considered in this EIS and then summarizes the management history.

Uranium enrichment in the United States began as part of the atomic bomb development by the Manhattan Project during World War II. Enrichment for both civilian and military uses continued after the war under the auspices of the U.S. Atomic Energy Commission and its successor agencies, including DOE. Three large gaseous diffusion plants (GDPs) were constructed to produce enriched uranium, first at the K-25 site (now called ETTP) and subsequently at Paducah and Portsmouth. The K-25 plant ceased operations in 1985, and the Portsmouth plant ceased operations in 2001. The Paducah GDP continues to operate.

The DUF_6 produced during enrichment has been stored in large steel cylinders at all three gaseous diffusion plant sites since the 1950s. The cylinders are typically stacked two high and are stored outdoors on concrete or gravel yards. Figure S-2 shows typical arrangements for storing cylinders.

DOE is currently responsible for the management of a total of approximately 700,000 metric tons (t) (770,000 short tons [tons])[1] of DUF_6 stored in about 60,000 cylinders at three storage sites. The cylinder inventory considered in this EIS is provided in Table S-1. This EIS considers the conversion of the approximately 250,000 t (275,000 tons) of DUF_6 stored in about 16,000 cylinders at Portsmouth and about 4,800 cylinders at ETTP. In addition, approximately 3,200 cylinders at Portsmouth and 1,600 cylinders at ETTP contain LEU-UF_6, normal UF_6, or are empty (collectively called "non-DUF_6" cylinders in this EIS). This EIS considers the shipment of all ETTP cylinders to Portsmouth, as well as the management of both the Portsmouth and

DUF_6 Management Time Line

1950–1993	DOE generates DUF_6 stored in cylinders at the ETTP, Portsmouth, and Paducah sites.
1985	K-25 (ETTP) GDP ceases operations.
1992	Ohio EPA issues Notice of Violation (NOV) to Portsmouth.
1993	USEC is created by P.L. 102-186.
1994	DOE initiates DUF_6 PEIS.
1995	DNFSB issues Recommendation 95-1, Safety of Cylinders Containing Depleted Uranium. DOE initiates UF_6 Cylinder Project Management Plan.
1996	USEC Privatization Act (P.L. 104-134) is enacted.
1997	DOE issues Draft DUF_6 PEIS.
1998	DOE and Ohio EPA reach agreement on NOV. Two DOE-USEC MOAs transfer 11,400 DUF_6 cylinders to DOE. P.L. 105-204 is enacted.
1999	DOE and TDEC enter consent order. DOE issues Final DUF_6 PEIS and Record of Decision. DOE issues conversion plan in response to P.L. 105-204. DNFSB closes Recommendation 95-1. DOE issues Draft RFP for conversion services.
2000	DOE issues Final RFP for conversion services.
2001	DOE receives five proposals in response to RFP. DOE identifies three proposals in competitive range. DOE publishes NOI for site-specific DUF_6 Conversion EIS. DOE prepares environmental critique to support conversion services procurement process. Portsmouth GDP ceases operations. DOE holds public scoping meetings for the site-specific DUF_6 Conversion EIS.
2002	DOE-USEC agreement transfers 23,000 t (25,684 tons) of DUF_6 to DOE. P.L. 107-206 is enacted. DOE awards conversion services contract to UDS. DOE prepares environmental synopsis to support conversion services procurement process.
2003	DOE announces Notice of Change in NEPA Compliance Approach and issues the draft EIS.

[1] In general, in this environmental impact statement (EIS), values in English units are presented first, followed by metric units in parentheses. However, when values are routinely reported in metric units, the metric units are presented first, followed by English units in parentheses.

a b

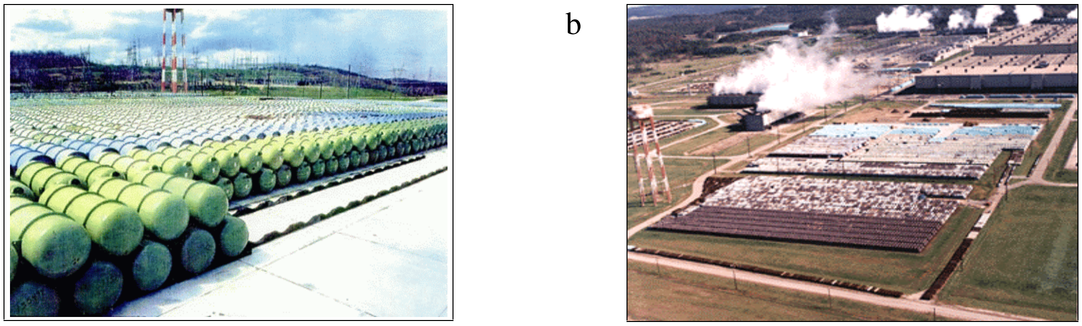

FIGURE S-2 Storage of DUF_6 Cylinders: (a) Cylinders stacked two high. (b) Cylinder storage yards at the Portsmouth site.

TABLE S-1 Inventory of DOE UF_6 Cylinders Considered in This EIS[a]

Location	No. of Cylinders	Weight of UF_6 (t)
Portsmouth – DUF_6	16,055	195,800
Non-DUF_6		
LEU-UF_6	1,451	19
Normal UF_6	1,255	13,500
Empty	472	0
ETTP[b] – DUF_6	4,817	54,300
Non-DUF_6		
LEU-UF_6	738	6
Normal UF_6	225	19
Empty	584	0
Total		
DUF_6	20,872	250,100
Non-DUF_6	4,725	13,544

[a] As of April 30, 2003.

[b] The proposed action calls for shipment of the ETTP cylinders to Portsmouth.

ETTP non-DUF_6 cylinders at Portsmouth. The ultimate disposition of the non-DUF_6 cylinders is outside the scope of this EIS.

S.1.1.1 Creation of USEC

In 1993, the U.S. government began the process of privatizing uranium enrichment services by creating the United States Enrichment Corporation (USEC), a wholly owned government corporation, pursuant to the *Energy Policy Act of 1992* (Public Law [P.L.] 102-186).

The Paducah and Portsmouth GDPs were leased to USEC, but DOE retained responsibility for storage, maintenance, and disposition of 46,422 DUF_6 cylinders produced before 1993 and located at the three gaseous diffusion plant sites (28,351 at Paducah, 13,388 at Portsmouth, and 4,683 at K-25). In 1996, the *USEC Privatization Act* (P.L. 104-134) transferred ownership of USEC from the government to private investors. This act provided for the allocation of USEC's liabilities between the U.S. government (including DOE) and the new private corporation, including liabilities for DUF_6 cylinders generated by USEC before privatization.

In May and June of 1998, USEC and DOE signed two memoranda of agreement (MOAs) regarding the allocation of responsibilities for depleted uranium generated by USEC after 1993. The two MOAs transferred ownership of a total of 11,400 DUF_6 cylinders from USEC to DOE.

On June 17, 2002, DOE and USEC signed a third agreement to transfer up to 23,300 t (25,684 tons) of DUF_6 from USEC to DOE between 2002 and 2006. The exact number of cylinders was not specified. Transfer of ownership of all the material will take place at Paducah.

Cylinder-Related Terms Used in This EIS

Types of UF_6

UF_6	A chemical composed of one atom of uranium combined with six atoms of fluorine. UF_6 is a volatile white crystalline solid at ambient conditions.
Normal UF_6	UF_6 made with uranium that contains the isotope uranium-235 at a concentration equal to that found in nature, that is, 0.7% uranium-235.
DUF_6	UF_6 made with uranium that contains the isotope uranium-235 in concentrations less than the 0.7% found in nature. In general, the DOE DUF_6 contains between 0.2% and 0.4% uranium-235.
LEU-UF_6	UF_6 made with uranium containing more than 0.7% but less than 20% uranium-235 (low-enriched uranium). In general, DOE LEU-UF_6 considered in this EIS contains less than 5% uranium-235.
Reprocessed UF_6	UF_6 made with uranium that was previously irradiated in a nuclear reactor and chemically separated during reprocessing.

Types of Cylinders

Full DUF_6	Cylinders filled to 62% of their volume with DUF_6 (some cylinders are slightly overfilled).
Partially Full	Cylinders that contain more than 50 lb (23 kg) of DUF_6 but less than 62% of their volume.
Heel	Cylinders that contain less than 50 lb (23 kg) of residual nonvolatile material left after the DUF_6 has been removed.
Empty	Cylinders that have had the DUF_6 and heel material removed and contain essentially no residual material.
Feed	Cylinders used to supply UF_6 into the enrichment process. Most feed cylinders contain natural UF_6, although some historically contained reprocessed UF_6.
Non-DUF_6	A term used in this EIS to refer to cylinders that contain LEU-UF_6, normal UF_6, or are empty.

S.1.1.2 Growing Concern over the DUF_6 Inventory

In May 1995, the Defense Nuclear Facilities Safety Board (DNFSB), an independent DOE oversight organization within the Executive Branch, issued Recommendation 95-1 regarding storage of the DUF_6 cylinders. This document advised that DOE should take three actions: (1) start an early program to renew the protective coating on cylinders containing DUF_6 from the historical production of enriched uranium, (2) explore the possibility of additional measures to protect the cylinders from the damaging effects of exposure to the elements as well as any additional handling that might be called for, and (3) institute a study to determine whether a more suitable chemical form should be selected for long-term storage of depleted uranium.

In response to Recommendation 95-1, DOE began an aggressive effort to better manage its DUF_6 cylinders, known as the *UF_6 Cylinder Project Management Plan*. This plan incorporated more rigorous and more frequent inspections, a multiyear schedule for painting and refurbishing cylinders, and construction of concrete-pad cylinder yards. In December 1999, the DNFSB determined that DOE's implementation of the *UF_6 Cylinder Project Management Plan* was successful, and, as a result, on December 16, 1999, it closed Recommendation 95-1.

Several affected states also expressed concern over the DOE DUF_6 inventory. In October 1992, the Ohio Environmental Protection Agency (OEPA) issued a Notice of Violation (NOV) alleging that DUF_6 stored at the Portsmouth facility is subject to regulation under state hazardous waste laws applicable to the Portsmouth GDP. The NOV stated that the OEPA had determined DUF_6 to be a solid waste and that DOE had violated Ohio laws and regulations by not evaluating whether such waste was hazardous. DOE disagreed with this assessment and entered into discussions with the OEPA that continued through February 1998, when an agreement was reached. Ultimately, in February 1998, DOE and the OEPA agreed to set aside the issue of whether the DUF_6 is subject to Resource Conservation and Recovery Act (RCRA) regulation and instituted a negotiated management plan governing the storage of the Portsmouth DUF_6. The agreement also requires DOE to continue its efforts to evaluate the potential use or reuse of the material. The agreement expires in 2008.

Similarly, in February 1999, DOE and the Tennessee Department of Environment and Conservation (TDEC) entered into a consent order that included a requirement for the performance of two environmentally beneficial projects: the implementation of a negotiated management plan governing the storage of the small inventory (relative to other sites) of all UF_6 (depleted, LEU, and natural) cylinders stored at the ETTP site and the removal of the DUF_6 from the ETTP site or the conversion of the material by December 31, 2009.

S.1.1.3 Programmatic NEPA Review and Congressional Interest

In 1994, DOE began work on a *Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride* (DUF_6 PEIS) to evaluate potential broad management options for DOE's DUF_6 inventory. Alternatives considered included continued storage of DUF_6 in cylinders at the gaseous diffusion plant sites or at a consolidated site, and the use of technologies for converting the DUF_6 to a more stable chemical form for long-term storage, use, or disposal. DOE issued the draft DUF_6 PEIS for public review and comment in December 1997 and held hearings near each of the three sites where DUF_6 is currently stored (Paducah, Kentucky; Oak Ridge, Tennessee; and Portsmouth, Ohio) and in Washington, D.C. In response to its efforts, DOE received some 600 comments.

In July 1998, while the PEIS was being prepared, the President signed into law P.L. 105-204. The text of P.L. 105-204 pertinent to the management of DUF_6 is as follows:

> *(a) PLAN. – The Secretary of Energy shall prepare, and the President shall include in the budget request for fiscal year 2000, a Plan and proposed legislation to ensure that all amounts accrued on the books of the United States Enrichment Corporation for the disposition of depleted uranium hexafluoride will be used to commence construction of, not later than January 31, 2004, and to operate, an onsite facility at each of the gaseous diffusion plants at Paducah, Kentucky, and Portsmouth, Ohio, to treat and recycle depleted uranium hexafluoride consistent with the National Environmental Policy Act.*

DOE began, therefore, to prepare a responsive plan while it proceeded with the PEIS.

In April 1999, DOE issued the final DUF_6 PEIS. The PEIS identified conversion of DUF_6 to another chemical form for use or long-term storage as part of the preferred management alternative. In the Record of Decision (ROD) (64 FR 43358, August 10, 1999), DOE decided to promptly convert the DUF_6 inventory to a more stable uranium oxide form. DOE also stated that it would use the depleted uranium oxide as much as possible and store the remaining depleted uranium oxide for potential future uses or disposal, as necessary. In addition, DUF_6 would be converted to depleted uranium metal only if uses for metal were available. DOE did not select a specific site or sites for the conversion facilities but reserved that decision for subsequent NEPA review. (This EIS is that site-specific review.)

Then, in July 1999, DOE issued the *Final Plan for the Conversion of Depleted Uranium Hexafluoride as Required by Public Law 105-204*. The Conversion Plan describes the steps that would allow DOE to convert the DUF_6 inventory to a more stable chemical form. It incorporates information received from the private sector in response to a DOE request for expressions of interest; ideas from members of the affected communities, Congress, and other interested stakeholders; and the results of the analyses for the final DUF_6 PEIS. The Conversion Plan describes DOE's intent to chemically process the DUF_6 to create products that would present a lower long-term storage hazard and provide a material suitable for use or disposal.

S.1.1.4 DOE Request for Contractor Proposals and Site-Specific NEPA Review

DOE initiated the Conversion Plan on July 30, 1999, by announcing the availability of a draft Request for Proposals (RFP) for a contractor to design, construct, and operate DUF_6 conversion facilities at the Paducah and Portsmouth sites.

In early 2000, on the basis of comments received on the draft RFP, DOE revisited some of the assumptions about managing the DUF_6 inventory that had been made previously in the PEIS and ROD. For example, DOE evaluated four potential conversion forms — that is, depleted triuranium octaoxide (U_3O_8), depleted uranium dioxide (UO_2), depleted uranium tetrafluoride (UF_4), and depleted uranium metal — and found that they should be acceptable for near-surface disposal at low-level radioactive waste (LLW) disposal sites located in arid climates, such as those at DOE's Nevada Test Site (NTS) and Envirocare of Utah, Inc. Therefore, the RFP was modified to allow for a wider range of potential conversion product forms and process technologies than had been reviewed in the DUF_6 PEIS. DOE stated that, if the selected conversion technology would generate one of the previously unconsidered products (e.g., depleted uranium metal or depleted UF_4), DOE would review the potential environmental impacts as part of the site-specific NEPA review.

On October 31, 2000, DOE issued a final RFP to procure a contractor to design, construct, and operate DUF_6 conversion facilities at the Paducah and Portsmouth sites. The RFP stated that any conversion facilities that would be built would have to convert the DUF_6 within a 25-year period to a more stable chemical form that would be suitable for either beneficial use or disposal. The selected contractor would use its proposed technology to design, construct, and operate the conversion facilities for an initial 5-year period. Operation would include (1) maintaining the DUF_6 inventories and conversion product inventories; (2) transporting all UF_6 storage cylinders currently located at ETTP to a conversion facility at the Portsmouth site, as appropriate; and (3) transporting to an appropriate disposal site any conversion product for which no use was found. The selected contractor would also be responsible for preparing such excess material for disposal.

In March 2001, DOE announced the receipt of five proposals in response to the RFP, and in August 2001, DOE deemed three of these proposals to be within the competitive range.

On September 18, 2001, DOE published the NOI in the *Federal Register* (66 FR 48123), announcing its intention to prepare an EIS for the proposed action to construct, operate, maintain, and decontaminate and decommission two DUF_6 conversion facilities at Portsmouth, Ohio, and Paducah, Kentucky. DOE held three scoping meetings to provide the public with an opportunity to present comments on the scope of the EIS and to ask questions and discuss concerns with DOE officials regarding the EIS. The scoping meetings were held in Piketon, Ohio, on November 28, 2001; in Oak Ridge, Tennessee, on December 4, 2001; and in Paducah, Kentucky, on December 6, 2001.

The alternatives identified in the NOI included a two-plant alternative (one at the Paducah site and another at the Portsmouth site), a one-plant alternative (only one plant would be built, at either the Paducah or the Portsmouth site), an alternative using existing UF_6 conversion capacity at commercial nuclear fuel fabrication facilities, and a no action alternative. For alternatives that involved constructing one or two new plants, DOE planned to consider alternative conversion technologies, local siting alternatives within the Paducah and Portsmouth site boundaries, and the shipment of DUF_6 cylinders stored at ETTP to either the Portsmouth site or to the Paducah site. The technologies to be considered in the EIS were those submitted in response to the October 2000 RFP, plus any other technologies that DOE believed must be considered.

S.1.1.5 Public Law 107-206 Passed by Congress

During the site-specific NEPA review process, Congress acted again regarding DUF_6 management, and on August 2, 2002, the President signed the *2002 Supplemental Appropriations Act for Further Recovery from and Response to Terrorist Attacks on the United States* (P.L. 107-206). The pertinent part of P.L. 107-206 required that, within 30 days of enactment, DOE must award a contract for the scope of work described in the October 2000 RFP, including design, construction, and operation of a DUF_6 conversion facility at each of the Department's Paducah, Kentucky, and Portsmouth, Ohio, sites (the relevant portions of the Appropriations Act are set forth in Appendix A of this EIS).

In response to P.L. 107-206, on August 29, 2002, DOE awarded a contract to UDS, for construction and operation of two conversion facilities. DOE also reevaluated the appropriate scope of its site-specific NEPA review and decided to prepare two separate EISs, one for the plant proposed for the Paducah site and a second for the Portsmouth site. This change in approach was announced in the *Federal Register* on April 28, 2003 (68 FR 22368).

S.1.1.6 Characteristics of DUF_6

The gaseous diffusion process uses uranium in the form of UF_6, primarily because UF_6 can conveniently be used in gaseous form for processing, in liquid form for filling or emptying containers, and in solid form for storage. Solid UF_6 is a white, dense, crystalline material that resembles rock salt. Depleted uranium is uranium that, through the enrichment process, has been stripped of a portion of the uranium-235 that it once contained so that its proportion is lower than the 0.7 percent by weight (wt%) found in nature. The uranium in most of DOE's DUF_6 has between 0.2 wt% and 0.4 wt% uranium-235.

The chemical and physical characteristics of DUF_6 pose potential health risks, and the material is handled accordingly. Uranium and its decay products in DUF_6 emit low levels of alpha, beta, gamma, and neutron radiation. If DUF_6 is released to the atmosphere, it reacts with water vapor in the air to form HF and a uranium oxyfluoride compound called uranyl fluoride (UO_2F_2). These products are chemically toxic to humans. Uranium is a heavy metal that, in addition to being radioactive, can have toxic chemical effects (primarily on the kidneys) if it enters the bloodstream by means of ingestion or inhalation. HF is an extremely corrosive gas that can damage the lungs and cause death if inhaled at high enough concentrations. In light of such characteristics, DOE stores DUF_6 in a manner designed to minimize the risk to workers, the public, and the environment.

As the inventory of DUF_6 cylinders ages, some cylinders have begun to show evidence of external corrosion. At Portsmouth, a total of two cylinder breaches have occurred. Six breaches have occurred at ETTP. (The remaining three breaches have occurred at Paducah.) However, since DUF_6 is solid at ambient temperatures and pressures, it is not readily released after a cylinder leak or breach due to corrosion. When a hole develops in a cylinder, moist air reacts with the exposed solid DUF_6 and iron, forming a dense plug of solid uranium and iron compounds and a small amount of HF gas. The plug limits the amount of material released from a breached cylinder. When a hole in a cylinder is identified, the cylinder is typically repaired or its contents are transferred to a new cylinder. Following a large release of solid UF_6, the UF_6 would slowly react with moisture in the air, forming UO_2F_2 and HF, which would be dispersed downwind. The presence of a fire can result in a more rapid reaction and a larger release of UO_2F_2 and HF.

Because reprocessed uranium was enriched in the early years of gaseous diffusion, some of the DUF_6 inventory is contaminated with small amounts of technetium (Tc) and the transuranic (TRU) elements plutonium (Pu), neptunium (Np), and americium (Am). The final RFP for conversion services concluded that any DUF_6 contaminated with TRU elements and Tc at the concentrations expected could be safely handled in a conversion facility. As discussed in this EIS, the risk associated with potential contamination would be relatively small, and those cylinders would be processed in the same manner as cylinders not containing TRU and Tc contamination.

S.1.2 Purpose and Need

DOE needs to convert its inventory of DUF_6 to a more stable chemical form for use or disposal. This need follows directly from (1) the decision presented in the August 1999 ROD for the PEIS, namely, to begin conversion of the DUF_6 inventory as soon as possible, and (2) P.L. 107-206, which directs DOE to award a contract for construction and operation of conversion facilities at both the Paducah site and the Portsmouth site, and to begin construction no later than July 31, 2004.

S.1.3 Proposed Action

The proposed action evaluated in this EIS is to construct and operate a conversion facility at the Portsmouth site for conversion of the Portsmouth and ETTP DUF_6 inventories into depleted U_3O_8. The action includes construction, operation, maintenance, and D&D of the proposed DUF_6 conversion facility at the Portsmouth site; transportation of DUF_6 cylinders from ETTP to Portsmouth for conversion, as well as transportation of the non-DUF_6 cylinders from ETTP to Portsmouth; construction of a new cylinder storage yard at Portsmouth (if required) for ETTP cylinders; transportation of depleted uranium conversion products and waste materials to a disposal facility; transportation and sale of the HF produced as a conversion co-product; and neutralization of HF to CaF_2 and its sale or disposal in the event that the HF product is not sold. The EIS also considers an option of shipping the cylinders stored at ETTP to Paducah rather than to Portsmouth.

S.1.4 Scope

The scope of an EIS refers to the range of actions, alternatives, and impacts it considers. As noted in Section S.1.1.4, on September 18, 2001, DOE published a NOI in the *Federal Register* (66 FR 48123) announcing its intention to prepare an EIS for a proposal to construct, operate, maintain, and decontaminate and decommission two DUF_6 conversion facilities at Portsmouth, Ohio, and Paducah, Kentucky. The NOI announced that the scoping period for the EIS would be open until November 26, 2001. The scoping period was later extended to January 11, 2002. During the scoping process, the public was given six ways to submit comments on the DUF_6 proposal to DOE, including public meetings, mail, facsimile transmission, voice messages, electronic mail, and through a dedicated Web site. DOE held public scoping meetings near Paducah, Kentucky, Portsmouth, Ohio, and Oak Ridge, Tennessee, to give the public an opportunity to present comments on the scope of the EIS and to ask questions and discuss concerns regarding the EIS with DOE officials. The scoping meetings were held in Piketon, Ohio, on November 28, 2001, and in Oak Ridge, Tennessee, on December 4, 2001. Approximately 140 comments were received from about 30 individuals and organizations during the scoping period via all media. These comments were examined to determine the proposed scope of this EIS. Comments were related primarily to five major issues: (1) DOE policy; (2) alternatives; (3) cylinder inventory, maintenance, and surveillance; (4) transportation; and (5) general environmental concerns. Comments received in response to the April 28, 2003, Notice of Change in NEPA Compliance Approach were similar to those made during the public scoping period and were also considered.

In general, the scope of this EIS as described in the NOI was not changed significantly as a result of the public scoping comments received. The alternatives that are evaluated and compared in this EIS represent reasonable alternatives for converting DUF_6. Three alternative locations within the Portsmouth site are evaluated in detail in this EIS for the proposed action as well as a no action alternative. In addition, this EIS considers the effects on the Portsmouth conversion facility if an option of shipping the cylinders at ETTP to Paducah were selected (although current proposals call for these cylinders to be shipped to Portsmouth). These alternatives and options, as well as alternatives considered but not evaluated in detail, are described in more detail in Chapter 2.

S.1.5 Relationship to Other NEPA Reviews

This DUF_6 Conversion EIS, along with the Paducah conversion facility EIS (DOE/EIS-0359), represent the second level of a tiered environmental review process being used to evaluate and implement DOE's DUF_6 Management Program. The project-level review in these conversion facility EISs incorporates, by reference, the programmatic analysis, as appropriate, from the DUF_6 PEIS published by DOE in 1999.

In addition to the Paducah conversion facility EIS, which is directly related to this EIS, DOE has prepared (or is preparing) other NEPA reviews that are related to the management of DUF_6 or to the current DUF_6 storage sites. These reviews were evaluated and their results taken into consideration in the preparation of this EIS. The related reviews included continued waste management activities, winterization activities associated with cold-standby of the Portsmouth GDP, industrial reuse of sections of the Portsmouth site, long-term management for DOE's inventory of potentially reusable uranium, and waste management activities at the Oak Ridge Reservation.

In addition, DOE prepared a Supplement Analysis for the shipment of up to 1,700 DUF_6 cylinders that meet transportation requirements from ETTP to Portsmouth in fiscal years (FYs) 2003 through 2005. Based on the Supplement Analysis, DOE issued an amended ROD to the PEIS concluding that the estimated impacts for the proposed transport of up to 1,700 cylinders were less than or equal to those considered in the PEIS and that no further NEPA documentation was required (68 FR 53603). However, because no shipments had occurred by the time this draft EIS was issued, and to account for uncertainties related to if and when such shipments would occur, this EIS considers shipment of all DUF_6 and non-DUF_6 at ETTP to Portsmouth by truck and rail.

S.1.6 Organization of This Environmental Impact Statement

This DUF_6 Conversion EIS consists of 10 chapters and 8 appendixes. Chapter 1 describes background information, the purpose and need for the DOE action, the scope of the assessment, and related NEPA reviews and other studies. Chapter 2 defines the alternatives considered in this EIS. Chapter 3 discusses the environmental setting at the Portsmouth and ETTP sites. Chapter 4 addresses the assumptions, approach, and methods used in the impact analyses. Chapter 5 discusses the potential environmental impacts of the alternatives, and Chapter 6 identifies the major laws, regulations, and other requirements applicable to implementing the alternatives. Chapter 7 lists the cited references used in preparing this EIS, and Chapter 8 lists the names of those who prepared this EIS. Chapter 9 is a glossary of technical terms used in this EIS, and Chapter 10 is a subject matter index.

Nine appendixes are included in this EIS, including a summary of the pertinent text from P.L. 107-206 (Appendix A), a discussion of issues associated with potential TRU and Tc contamination (Appendix B), comments received during public scoping and from the Notice of Change in NEPA Compliance Approach (Appendix C), the environmental synopsis prepared to support the DUF_6 conversion procurement process (Appendix D), the potential sale of HF and CaF_2 and estimated health and socioeconomic impacts associated with their use (Appendix E), a description of discipline-specific assessment methodologies (Appendix F), letters of consultation (Appendix G), and the contractor disclosure statement (Appendix H).

S.2 ALTERNATIVES

The alternatives considered in this EIS are summarized in Table S-2 and described below.

TABLE S-2 Summary of Alternatives Considered for the Portsmouth Conversion Facility EIS

Alternative	Description	Options Considered
No Action	Continued storage of the DUF_6 cylinders indefinitely at the Portsmouth and ETTP sites, with continued cylinder surveillance and maintenance.	None.
Proposed Action	Construction and operation of a DUF_6 conversion facility at the Portsmouth site for conversion of the Portsmouth DUF_6 inventory and the DUF_6 inventory currently stored at ETTP. This EIS assesses the potential environmental impacts from the following proposed activities: • Construction, operation, maintenance, and D&D of the proposed DUF_6 conversion facility at the Portsmouth site; • Transportation of DUF_6 and non-DUF_6 cylinders from ETTP to Portsmouth; • Construction of a new cylinder storage yard (if required) for ETTP cylinders; • Transportation of uranium conversion products and waste materials to a disposal facility; • Transportation and sale of the HF conversion product; and • Neutralization of HF to CaF_2 and sale or disposal in the event that the HF product is not sold.	*ETTP Cylinders:* This EIS considers an option of shipping cylinders at ETTP to Paducah. *Transportation:* This EIS evaluates the shipment of cylinders and conversion products by both truck and rail.
Alternative Location A (Preferred)	Construction of the conversion facility at Location A, an area that encompasses 26 acres (10 ha) in the west-central portion of the site.	
Alternative Location B	Construction of the conversion facility at Location B, an area that encompasses 50 acres (20 ha) in the southwest portion of the site.	
Alternative Location C	Construction of the conversion facility at Location C, an area that encompasses 78 acres (31 ha) in the southeast portion of the site.	

S.2.1 No Action Alternative

Under the no action alternative, it is assumed that DUF_6 cylinder storage would continue indefinitely at the Portsmouth and ETTP sites. The no action alternative assumes that DOE would continue surveillance and maintenance activities to ensure the continued safe storage of cylinders. Potential environmental impacts are estimated through the year 2039. The year 2039 was selected to be consistent with the PEIS, which evaluated a 40-year cylinder storage period (1999–2039). In addition, long-term impacts (i.e., occurring after 2039) from potential cylinder breaches are assessed.

Alternatives Considered in This EIS

No Action — NEPA regulations require evaluation of a no action alternative as a basis for comparing alternatives. In this EIS, the no action alternative is storage of DUF_6 and non-DUF_6 cylinders indefinitely in yards at the Portsmouth and ETTP sites, with continued cylinder surveillance and maintenance activities.

Proposed Action — Construction and operation of a DUF_6 conversion plant at the Portsmouth site, with shipment of ETTP cylinders to Portsmouth for conversion. DUF_6 would be converted to depleted U_3O_8 based on the UDS conversion technology.

Action Alternatives — Three action alternatives focus on where to construct the conversion facility within the Portsmouth site (Alternative Locations A, B, and C) The preferred alternative is Location A.

Specifically, the activities assumed to occur under no action include routine cylinder inspections, ultrasonic testing of the wall thicknesses of selected cylinders, painting of selected cylinders to prevent corrosion, cylinder yard surveillance and maintenance, and relocation of some cylinders. It was assumed that cylinders would be painted every 10 years. On the basis of these activities, an assessment of the potential impacts on workers, members of the general public, and the environment was conducted.

For assessment purposes in this EIS, two cylinder breach cases were evaluated. In the first case, it was assumed that the planned cylinder maintenance and painting program would maintain the cylinders in a protected condition and control further corrosion. In this case, it was assumed that after the initial painting, some cylinder breaches would occur from handling damage; the total numbers of future breaches estimated to occur through 2039 were 16 for the Portsmouth site and 7 for the ETTP site. In the second case, it was assumed that external corrosion would not be halted by improved storage conditions, cylinder maintenance, and painting. This case was considered in order to account for uncertainties with regard to how effective painting would be in controlling cylinder corrosion and uncertainties in the future painting schedule. In this case, the numbers of future breaches estimated through 2039 were 74 for the Portsmouth site and 213 for the ETTP site.

The estimated numbers of future breaches at the Portsmouth and ETTP sites were used to estimate potential impacts that might occur during the repair of breached cylinders and impacts from releases that might occur during continued cylinder storage.

S.2.2 Proposed Action Alternatives

The proposed action evaluated in this EIS is to construct and operate a conversion facility at the Portsmouth site for converting the DUF_6 inventory stored at the Portsmouth and ETTP sites. Three alternative locations within the Portsmouth site are evaluated (see Table S-2). The proposed action includes shipping the ETTP cylinders to Portsmouth and construction of a new cylinder storage yard at Portsmouth for the ETTP cylinders, if required. The conversion facility would convert DUF_6 into a stable chemical form for beneficial use/reuse and/or disposal. The off-gas from the conversion process would yield aqueous HF, which would be processed and marketed or converted to a solid for sale or disposal. To support the conversion operations, the emptied DUF_6 cylinders would be stored, handled, and processed for disposal. The time period considered is a construction period of approximately 2 years, an operational period of 18 years, and a 3-year period for the D&D of the facility. Current plans call for construction to begin in the summer of 2004. The assessment is based on the conceptual conversion facility design proposed by the selected contractor, UDS (see text box below).

Proposed Action

The proposed action in this EIS is construction and operation of a DUF_6 conversion facility at the Portsmouth site for conversion of the Portsmouth and ETTP DUF_6 inventories. DUF_6 would be converted to depleted U_3O_8; DUF_6 and non-DUF_6 cylinders would be transported from ETTP to Portsmouth; and a cylinder storage yard would be constructed at Portsmouth for ETTP cylinders, if required. Three alternative locations within the Portsmouth site are evaluated (Locations A, B, and C).

The action alternatives focus on where to site the conversion facility within the Portsmouth site. The Portsmouth site was evaluated to identify alternative locations for a conversion facility. The three alternative locations identified at the Portsmouth site, denoted Locations A, B, and C, are shown in Figure S-3.

Conversion Facility Design

This EIS is based on the conversion facility design being developed by UDS, the selected conversion contractor. At the time this draft EIS was prepared, the UDS design was in the conceptual stage, with several facility design options being considered. This EIS identifies and evaluates these options to the extent possible.

Following the public comment period, the draft EIS will be revised on the basis of comments received and in order to incorporate any significant changes that occurred in the conversion facility design.

S.2.2.1 Alternative Location A (Preferred Alternative)

Location A is the preferred location for the conversion facility and is located in the west-central portion of the site, encompassing 26 acres (10 ha). This location has three existing structures that were formerly used to store containerized lithium hydroxide monohydrate. The site was rough graded, and storm water ditch systems were installed. Two railroad spurs existed at one time in this area. One has had the track and ties removed, and the other has fallen into disrepair. This location was identified in the RFP for conversion services as the site for which bidders were to design their proposed facilities.

S.2.2.2 Alternative Location B

Location B is in the southwest portion of the site and encompasses approximately 50 acres (20 ha). The site has two existing structures built as part of the gas centrifuge enrichment project that was begun in the early 1980s and was terminated in 1985. The open field to the east of the buildings was developed during the same time period; it was rough graded, and storm water systems were installed. USEC is currently in the process of developing and demonstrating an advanced enrichment technology based on gas centrifuges. An application for a lead test facility to be operated at the Portsmouth site was submitted to the U.S. Nuclear Regulatory Commission (NRC) on February 11, 2003. The lead facility would be located in the existing gas centrifuge buildings within Location B. Therefore, Location B might not be available for construction of the conversion facility.

S.2.2.3 Alternative Location C

Location C is in the southeast portion of the site and has an area of about 78 acres (31 ha). This location consists of a level to very gently rolling grass field. It was graded during the construction of the Portsmouth site and has been maintained as grass fields since then.

S.2.2.4 Conversion Process Description

The proposed conversion system is based on a proven commercial process in operation at the Framatome Advanced Nuclear Power fuel fabrication facility in Richland, Washington. The UDS dry conversion is a continuous process in which DUF_6 is vaporized and converted to U_3O_8 by reaction with steam and hydrogen in a fluidized-bed conversion unit. The hydrogen is generated using anhydrous ammonia (NH_3), although an option of using natural gas is being investigated. Nitrogen is also used as an inert purging gas and is released to the atmosphere through the building stack as part of the clean off-gas stream. The depleted U_3O_8 powder is collected and packaged for disposition. The process equipment would be arranged in parallel lines. Each line would consist of two autoclaves, two conversion units, a HF recovery system, and process off-gas scrubbers. The Portsmouth facility would have three parallel conversion lines. Equipment would also be installed to collect the HF co-product and process it into any combination of several marketable products. A backup HF acid neutralization system would be provided to convert up to 100% of the HF acid to CaF_2 for storage and/or sale in the future, if necessary. Figure S-4 is an overall material flow diagram for the conversion facility; Figure S-5 is a conceptual facility site plan. A summary of key facility characteristics is presented in Table S-3.

The conversion facility will be designed to convert 13,500 t (15,000 tons) of DUF_6 per year, requiring 18 years to convert the Portsmouth and ETTP inventories. The footprint of the Portsmouth process building would be approximately 19,400 ft^2 (1,800 m^2). The conversion facility would occupy a total of approximately 10 acres (4 ha), with up to 65 acres (26 ha) of land

TABLE S-3 Summary of Portsmouth Conversion Facility Parameters

Parameter/Characteristic	Value
Construction start	2004
Construction period	2 years
Start of operations	2006
Operational period	18 years
Facility footprint	10 acres (4 ha)
Facility throughput	13,500 t/yr (15,000 tons/yr) DUF_6 (≈1,000 cylinders/yr)
Conversion products	
Depleted U_3O_8	10,700 t/yr (11,800 tons/yr)
CaF_2	18 t/yr (20 tons/yr)
70% HF acid	2,500 t/yr (2,800 tons/yr)
49% HF acid	5,700 t/yr (6,300 tons/yr)
Steel (emptied cylinders, if not used as disposal containers)	1,177 t/yr (1,300 tons/yr)

disturbed during construction (including temporary construction lay-down areas and utility access). Some of the disturbed areas would be areas cleared for railroad or utility access, not adjacent to the construction area.

The conversion process would generate four conversion products that have a potential use or reuse: depleted U_3O_8, HF, CaF_2, and steel from emptied DUF_6 cylinders (if not used as disposal containers). DOE has been working with industrial and academic researchers for several years to identify potential uses for these products. Some potential uses for depleted uranium exist or are being developed, and DOE believes that a viable market exists for the HF generated during conversion. To take advantage of these to the extent possible, DOE requested in the RFP that the bidders for conversion services investigate and propose viable uses. Table S-4 summarizes the probable disposition paths identified by UDS for each of the conversion products.

S.2.2.5 Preparation and Transportation of ETTP Cylinders to Portsmouth

DOE proposes to ship the DUF_6 and non-DUF_6 cylinders at ETTP to Portsmouth. All shipments of ETTP cylinders would have to be made in accordance with applicable U.S. Department of Transportation (DOT) regulations for the shipment of radioactive materials as specified in Title 49 of the CFR (see text box on page S-21). The cylinders could be shipped by truck, rail, or barge. A large number of the ETTP DUF_6 cylinders do not meet the DOT requirements intended to maintain the safety of shipments during both routine and accident conditions. Some cylinders have physically deteriorated such that they no longer meet the DOT requirements, and for some, the required cylinder documentation has been lost.

TABLE S-4 Summary of Proposed Conversion Product Treatment and Disposition

Conversion Product	Treatment	Proposed Disposition	Optional Disposition
Depleted U_3O_8	Packaged in either bulk bags or emptied cylinders for disposal.	Disposal at Envirocare of Utah, Inc.[a]	Disposal at NTS.[a]
CaF_2	Similar to depleted U_3O_8.	Commercial sale pending DOE approval of authorized release limits.	Disposal at Envirocare of Utah, Inc.[a]
HF acid (70% and 49%)	HF would be commercial grade and stored on site until loaded into rail tank cars.	Sale to commercial HF acid supplier pending DOE approval of authorized release limits.	Neutralization of HF to CaF_2 for use or disposal.
Steel (emptied cylinders)	If bulk bags were used for U_3O_8 disposal, emptied cylinders would be processed for disposal. An option of using the emptied cylinders as disposal containers is also being considered.	Disposal at Envirocare of Utah, Inc.[a]	Disposal at NTS.[a]

[a] In the event that other disposal options become available in the future, additional NEPA or environmental review may be required.

Before shipment, each cylinder would be inspected to determine if it met DOT requirements. This inspection would include a record review to determine if the cylinder was overfilled; a visual inspection for damage or defects; a pressure check to determine if the cylinder was overpressurized; and an ultrasonic wall thickness measurement (based on a visual inspection, if necessary). If a cylinder passed the inspection, the appropriate documentation would be prepared, and the cylinder would be loaded directly for shipment.

This EIS considers two ways of preparing noncompliant cylinders at ETTP for shipment: cylinder overpacks and use of a cylinder transfer facility. An overpack is a container into which a cylinder is placed for shipment. The metal overpack would be designed, tested, and certified to meet all DOT shipping requirements. It would be suitable for containing, transporting, and storing the cylinder contents regardless of cylinder condition. The second option considers the transfer of the DUF_6 from substandard cylinders to new or used cylinders that would meet all DOT requirements. This option could require the construction of a new cylinder transfer facility at ETTP, for which there are no current plans. Transportation impacts are estimated for shipment by both truck and rail after cylinder preparation.

S.2.2.6 Construction of a New Cylinder Storage Yard at Portsmouth

It may be necessary to construct an additional yard at Portsmouth for storing the ETTP cylinders, depending on when and at what rate the ETTP cylinders are shipped. DOE is currently in the process of determining if a new yard is required, or if existing storage yard space could be used for the ETTP cylinders. The potential environmental impacts from the construction of a new cylinder storage yard at two possible locations have been included in this EIS to account for current uncertainties (Figure S-6).

S.2.2.7 Option of Shipping ETTP Cylinders to Paducah

As discussed above, DOE proposes to ship the DUF_6 and non-DUF_6 cylinders at ETTP to Portsmouth. However, this EIS considers shipping the ETTP cylinders to Paducah as an option. If the ETTP cylinders were shipped to Paducah, the Portsmouth conversion facility would have to operate for 14 rather than 18 years to convert the Portsmouth inventory. In Chapter 5, this EIS presents a discussion of the potential environmental impacts associated with this reduction in the operational period. Potential impacts associated with transportation of the ETTP cylinders to Paducah are evaluated in detail in the site-specific Paducah conversion facility EIS (DOE/EIS-0359).

Transportation Requirements for DUF_6 Cylinders

All shipments of UF_6 cylinders have to be made in accordance with applicable DOT regulations for the shipment of radioactive materials; specifically, the provisions of 49 CFR Part 173, Subpart I. The DOT regulations require that each UF_6 cylinder be designed, fabricated, inspected, tested, and marked in accordance with the various engineering standards that were in effect at the time the cylinder was manufactured. The DOT requirements are intended to maintain the safety of shipments during both routine and accident conditions. Three provisions are particularly important relative to DUF_6 cylinder shipments:

1. A cylinder must be filled to less than 62% of the certified volumetric capacity (the fill limit was reduced from 64% to 62% in about 1987).

2. The pressure within a cylinder must be less than 14.8 psia (subatmospheric pressure).

3. A cylinder must be free of cracks, excessive distortion, bent or broken valves or plugs, and broken or torn stiffening rings or skirts, and it must not have a shell thickness that has decreased below a specified minimum value. (Shell thicknesses are assessed visually by a code vessel inspector, and ultrasonic testing may be specified at the discretion of the inspector to verify wall thickness, when and in areas the inspector deems necessary.)

S.2.2.8 Possible Extension of Conversion Facility Operations and the Potential for Paducah-to-Portsmouth DUF_6 Cylinder Shipments

The conversion facilities at Portsmouth and Paducah are being designed to process the DOE DUF_6 cylinder inventories at these sites over 18 and 25 years, respectively. There are no current plans to operate the conversion facilities beyond these time periods. However, future activities could potentially result in a decision to extend conversion facility operations. These include future DOE management responsibility for DUF_6 in addition to the current inventory, due to regulatory changes or possible MOAs between USEC and DOE; development of an advanced enrichment technology by USEC at Portsmouth that would generate DUF_6 that might be transferred to DOE; and new commercial uranium enrichment facilities that may be built and operated in the United States by commercial companies other than USEC. In addition, because the Portsmouth facility would conclude operations approximately 7 years before the current Paducah inventory would be converted at the Paducah site, it is possible that some DUF_6 cylinders could be transferred from Paducah to Portsmouth, particularly if DOE assumes responsibility for additional DUF_6 at Paducah. These possibilities are discussed and evaluated in this EIS.

S.2.3 Alternatives Considered but Not Analyzed in Detail

S.2.3.1 Use of Commercial Conversion Capacity

An alternative examined was using existing UF_6 conversion capacity at commercial nuclear fuel fabrication facilities that convert natural or LEU-UF_6 to UO_2 in lieu of constructingnew conversion capacity for DUF_6. This alternative was not analyzed in detail because the small capacity possibly available to DOE, coupled with the low interest level expressed by facility owners, indicates that the feasibility of this suggested alternative is low, and the duration of the conversion period is long (more than 125 years).

S.2.3.2 Sites Other Than Portsmouth

The consideration of alternative sites was limited to alternative locations within the Portsmouth site because P.L. 107-206 identifies Paducah and Portsmouth as the sites for construction of conversion facilities. In addition, no alternative sites were identified during the public scoping process for constructing and operating conversion facilities, and the generic impacts of conversion at a representative site were already evaluated in the DUF_6 PEIS.

S.2.3.3 Alternative Conversion Processes

Potential environmental impacts associated with alternative conversion processes were considered during the procurement process, including the preparation of an environmental critique and environmental synopsis (Appendix D of this EIS), which were prepared in accordance with the requirements of 10 CFR 1021.216. The environmental synopsis concluded that, on the basis of assessment of potential environmental impacts presented in the critique, no proposal received by DOE was clearly environmentally preferable. The potential environmental impacts associated with the proposals were found to be similar to, and generally less than, those presented in the DUF_6 PEIS for representative conversion technologies.

S.2.3.4 Long-Term Storage and Disposal Alternatives

There are no current plans for long-term storage of conversion products; long-term storage alternatives were analyzed in the PEIS, including storage as DUF_6 and storage as an oxide (either U_3O_8 or UO_2). The potential environmental impacts from long-term storage were evaluated for representative and generic sites. Therefore, long-term storage alternatives were not evaluated in this EIS.

With respect to disposal, this EIS evaluates the impacts from packaging, handling, and transporting depleted uranium conversion products from the conversion facility to a LLW disposal facility that would be (1) selected in a manner consistent with DOE policies and orders and (2) authorized or licensed to receive the conversion products by DOE (in conformance with DOE orders), the NRC (in conformance with NRC regulations), or an NRC Agreement State agency (in conformance with state laws and regulations determined to be equivalent to NRC regulations). Assessment of the impacts and risks from on-site handling and disposal at the LLW disposal facility is deferred to the disposal site's site-specific NEPA or licensing documents. However, this EIS covers the impacts from transporting the DUF_6 conversion products to both the Envirocare of Utah, Inc., facility and the NTS.

S.2.3.5 Other Transportation Modes

Transportation by air and barge were considered but not analyzed in detail. Transportation by air was deemed to not be reasonable for the types and quantities of materials that would be transported to and from the conversion site. Transportation by barge was also considered. ETTP is the only site with a functioning barge facility. Portsmouth would either have to build new facilities or use existing facilities that are located 20 to 30 mi (32 to 48 km) from the Portsmouth site. Use of existing facilities would require on-land transport by truck or rail over the 20- to 30-mi (32- to 48-km) distance, and the cylinders would have to go through one extra unloading/loading step at the end of the barge transport. Currently, there are no initiatives to build new barge facilities closer to the Portsmouth site. If barge shipment was proposed in the future, an additional environmental review might be required.

S.2.3.6 One Conversion Plant for Two Sites

In the NOI published in the *Federal Register* on September 18, 2001, construction and operation of one conversion plant was identified as a preliminary alternative that would be considered in the conversion EIS. However, with the passage of P.L. 107-206, which mandates the construction and operation of conversion facilities at both Paducah and Portsmouth, the one conversion plant alternative was considered but not analyzed in this EIS.

S.3 AFFECTED ENVIRONMENT

This EIS considers the proposed action at the Portsmouth site for conversion of the Portsmouth and ETTP DUF_6 inventories. Chapter 3 presents a detailed description of the affected environment at and around the Portsmouth and ETTP sites. Environmental resources that could be affected at Portsmouth and ETTP include the following:

- Cylinder yards,
- Site infrastructure,
- Air quality,
- Noise,
- Soils,
- Surface and groundwater,
- Vegetation,
- Wildlife,
- Wetlands,
- Threatened and endangered species,
- Public and occupational safety and health,
- Socioeconomics,
- Waste management,
- Land use,
- Cultural resources, and
- Environmental justice.

S.4 ENVIRONMENTAL IMPACT ASSESSMENT APPROACH, ASSUMPTIONS, AND METHODOLOGY

Potential environmental impacts were assessed by examining all of the activities required to implement each alternative, including construction of the required facility, operation of the facility, and transportation of materials between sites (Figure S-7). For continued cylinder storage under the no action alternative, potential long-term impacts from cylinder breaches occurring at Portsmouth and ETTP were also estimated. For each alternative, potential impacts to workers, members of the general public, and the environment were estimated for both normal operations and for potential accidents.

The analysis for this EIS considered all potential areas of impact and emphasized those that might have a significant impact on human health or the environment, would be different under different alternatives, or would be of special interest to the public (such as potential radiation effects). The estimates of potential environmental impacts for the action alternatives were based on characteristics of the proposed UDS conversion facility.

The process of estimating environmental impacts from the conversion of DUF_6 is subject to some uncertainty because final facility designs are not yet available. In addition, the methods used to estimate impacts have uncertainties associated with their results. This EIS impact assessment was designed to ensure — through selection of assumptions, models, and input parameters — that impacts would not be underestimated and that relative comparisons among the alternatives would be valid and meaningful. Although uncertainty may characterize estimates of the absolute magnitude of impacts, a uniform approach to impact assessment enhances the ability to make valid comparisons among alternatives. This uniform approach was implemented in the analyses conducted for this EIS to the extent practicable.

Table S-5 summarizes the major assumptions and parameters that formed the basis of the analyses in this EIS.

S.5 CONSEQUENCES AND COMPARISON OF ALTERNATIVES

This draft EIS analyzes potential impacts at the Portsmouth and ETTP sites under both the no action alternative and the proposed action alternatives. Under the no action alternative, potential impacts associated with the continued storage of DUF_6 cylinders in yards are evaluated through 2039; in addition, the long-term impacts that could result from releases of DUF_6 and HF from future cylinder breaches are evaluated. For the proposed action, potential impacts are evaluated at three alternative locations for a construction period of 2 years and an operational period of 18 years; impacts at ETTP from the preparation of cylinders for shipment is also included.

The potential environmental impacts at Portsmouth under the proposed action alternatives and under the no action alternative are presented in Table S-6 (placed at the end of this summary). To supplement the information in Table S-6, each area of impact evaluated in this EIS is discussed below. Major similarities and differences among the alternatives are highlighted. Additional details and discussion are provided in Chapter 5 for each alternative.

S.5.1 Human Health and Safety — Construction and Normal Facility Operations

Under the no action and action alternatives, it is estimated that potential exposures of workers and members of the general public to radiation and chemicals would be well within applicable public health standards and regulations during normal facility operations. The estimated doses and risks from radiation and/or chemical exposures of the general public and noninvolved workers would be very low, with zero latent cancer fatalities (LCFs) expected among these groups over the time periods considered, and with minimal adverse health impacts from chemical exposures expected. (Dose and risk estimates are shown in Table S-6.) In general, the location of a conversion facility within the Portsmouth site would not significantly affect potential impacts (i.e., no significant differences in impacts from alternative Locations A, B, or C were identified) to workers or the general public during normal facility operations.

Involved workers (persons directly involved in the handling of radioactive or hazardous materials) could be exposed to low-level radiation emitted by uranium during the normal course of their work activities, and this exposure could result in a slight increase in the risk for radiation-induced LCFs to individual involved workers. (The possible presence of TRU and Tc contamination in the cylinder inventory would not contribute to exposures during normal operations.) The annual number of workers exposed could range from about 33 (under the no action alternative for Portsmouth and ETTP combined) to 140 under the action alternatives. Under all alternatives, it is estimated that radiation exposure of involved workers would not result in additional LCFs among the entire involved worker populations (risks from radiation exposure range from a 1-in-10 chance of one additional LCF among the entire conversion facility

TABLE S-5 Summary of Major EIS Data and Assumptions

Parameter/Characteristic	Data/Assumption
General	
Portsmouth DUF_6 cylinder inventory	16,055 cylinders; 195,800 t (216,000 tons)
Portsmouth non-DUF_6 cylinder inventory	3,178 cylinders; 13,500 t (14,900 tons)
ETTP DUF_6 cylinder inventory	4,817 cylinders; 54,300 t (60,000 tons)
ETTP non-DUF_6 cylinder inventory	1,547 cylinders; 25 t (28 tons)
No Action Alternative	No conversion facility constructed; continued long-term storage of DUF_6 and non-DUF_6 in cylinders at Portsmouth and ETTP.
Assessment period	Through 2039, plus long-term impacts
Construction	None
Cylinder management	Continued surveillance and maintenance activities consistent with current plans and procedures.
Assumed total number of future cylinder breaches:	
Controlled-corrosion case	16 at Portsmouth; 7 at ETTP
Uncontrolled-corrosion case	74 at Portsmouth; 213 at ETTP
Action Alternatives	Build and operate a conversion facility at the Portsmouth site for conversion of the Portsmouth and ETTP DUF_6 inventories; construct a new cylinder storage yard at Portsmouth for ETTP cylinders.
Construction start	2004
Construction period	≈2 years
Start of operations	2006
Operational period	18 years (14 years if ETTP cylinders are converted at Paducah)
Facility footprint	10 acres (4 ha)
Facility throughput	13,500 t/yr (15,000 tons/yr) DUF_6
Conversion products	
Depleted U_3O_8	10,700 t/yr (11,800 tons/yr)
CaF_2	18 t/yr (20 tons/yr)
70% HF acid	2,500 t/yr (2,800 tons/yr)
49% HF acid	5,700 t/yr (6,300 tons/yr)
Steel (empty cylinders, if not used as disposal containers)	1,177 t/yr (1,300 tons/yr)

involved worker population over the life of the project to a 1-in-5 chance of one additional LCF among the involved cylinder maintenance workers at Portsmouth under the no action alternative).

Possible radiological exposures from using groundwater potentially contaminated as a result of releases from breached cylinders or facility releases were also evaluated. In general, these exposures would be within applicable public health standards and regulations. However, the uranium concentration in groundwater could exceed 20 µg/L at some time in the future under the no action alternative if cylinder corrosion was not controlled. This scenario is highly unlikely because ongoing cylinder inspections and maintenance would prevent significant releases from occurring.

Key Concepts in Estimating Risks from Radiation

The health effect of concern from exposure to radiation at levels typical of environmental and occupational exposures is the inducement of cancer. Radiation-induced cancers may take years to develop following exposure and are generally indistinguishable from cancers caused by other sources. Current radiation protection standards and practices are based on the premise that any radiation dose, no matter how small, can result in detrimental health effects (cancer) and that the number of effects produced is in direct proportion to the radiation dose. Therefore, doubling the radiation dose is assumed to result in doubling the number of induced cancers. This approach is called the "linear-no-threshold hypothesis" and is generally considered to result in conservative estimates (i.e., over-estimates) of the health effects from low doses of radiation.

S.5.2 Human Health and Safety — Facility Accidents

S.5.2.1 Physical Hazards

Under all alternatives, workers could be injured or killed as a result of on-the-job accidents unrelated to radiation or chemical exposure. On the basis of accident statistics for similar industries, it is estimated that under the no action alternative, zero fatalities and about 70 injuries might occur through 2039 at the Portsmouth and ETTP sites (about 1 injury per year at Portsmouth, and about 0.7 injury per year at ETTP). Under the action alternatives, the risk of physical hazards would not depend on the location of the conversion facility. No fatalities are predicted, but about 11 injuries during conversion facility construction and up to 142 injuries during operations could occur at the conversion facility (about 6 injuries per year during a 2-year construction period and about 8 injuries per year during operations). In addition, 1 injury would be expected from construction of a new cylinder yard for ETTP cylinders. Accidental injuries and deaths are not unusual in industries that use heavy equipment to manipulate heavy objects and bulk materials.

S.5.2.2 Facility Accidents Involving Radiation or Chemical Releases

Under all alternatives, it is possible that accidents could release radiation or chemicals to the environment, potentially affecting both the workers and members of the general public. Of all the accidents considered, those involving DUF_6 cylinders and those involving chemicals at the conversion facility would have the largest potential effects.

Under all alternatives, accidents involving DUF_6 cylinders could occur at the current storage locations. Cylinder accidents could release DUF_6 to the environment. If a release occurred, the DUF_6 would combine with moisture in the air, forming gaseous HF and UO_2F_2, a soluble solid in the form of small particles. The depleted uranium and HF could be dispersed downwind, potentially exposing workers and members of the general public to radiation and chemical effects. The amount released would depend on the severity of the accident and the number of cylinders involved. The probability of cylinder accidents would decrease under the action alternatives as the DUF_6 was converted and the number of cylinders in storage decreased as a result.

For releases involving DUF_6 and other uranium compounds, both chemical and radiological effects could occur if the material was ingested or inhaled. The chemical effect of most concern associated with internal uranium exposure is kidney damage, and the radiological effect of concern is an increase in the probability of developing cancer. With regard to uranium, chemical effects occur at lower exposure levels than do radiological effects. Exposure to HF from accidental releases could result in a range of health effects, from eye and respiratory irritation to death, depending on the exposure level. Large anhydrous NH_3 releases could also cause severe respiratory irritation and death (NH_3 is used to generate hydrogen, which is required for the conversion process).

Chemical and radiological exposures to involved workers under accident conditions would depend on how rapidly the accident developed, the exact location and response of the workers, the direction and amount of the release, the physical forces causing or caused by the accident, meteorological conditions, and the characteristics of the room or building if the accident occurred indoors. Impacts to involved workers under accident conditions would likely be dominated by physical forces from the accident itself; thus, quantitative dose/effect estimates would not be meaningful. For these reasons, the impacts to involved workers during accidents are not quantified in this EIS. However, it is recognized that injuries and fatalities among involved workers would be possible if an accident did occur.

Under the no action alternative, for accidents involving cylinders that might

Health Effects from Accidental Chemical Releases

The impacts from accidental chemical releases were estimated by determining the numbers of people downwind who might experience adverse effects and irreversible adverse effects:

Adverse effects – Any adverse health effects from exposure to a chemical release, ranging from mild and transient effects, such as respiratory irritation or skin rash (associated with lower chemical concentrations), to irreversible (permanent) effects, including death or impaired organ function (associated with higher chemical concentrations).

Irreversible adverse effects – A subset of adverse effects, irreversible adverse effects are those that generally occur at higher concentrations and are permanent in nature. Irreversible effects may include death, impaired organ function (such as central nervous system or lung damage), and other effects that may impair everyday functions.

happen at least once in 100 years (i.e., likely accidents), it is estimated that the off-site concentrations of HF and uranium would be considerably below levels that would cause adverse chemical effects among members of the general public from exposure to these chemicals (see text box). However, if the accident occurred at the ETTP site, up to 70 noninvolved workers might experience potential adverse effects from exposure to HF and uranium (mild and temporary effects, such as respiratory irritation or temporary decrease in kidney function). It is estimated that up to 3 noninvolved workers would experience potential irreversible adverse effects that are permanent in nature (such as lung damage or kidney damage); no fatalities are expected. Radiation exposures would be unlikely to result in additional LCFs among noninvolved workers or members of the general public for these types of accidents.

Cylinder accidents that are less likely to occur could be more severe, having greater consequences that could potentially affect off-site members of the general public. These types of accidents are considered extremely unlikely, expected to occur with a frequency of between once in 10,000 years and once in 1 million years of operations. Through 2039, the probability of this type of accident would be about 1 chance in 2,500. Among all the cylinder accidents analyzed, the postulated accident that would result in the largest number of people with adverse effects (including mild and temporary as well as permanent effects) would be an accident that involves rupture of cylinders in a fire. If this type of accident occurred at the Portsmouth site, it is estimated that up to 680 members of the general public and up to 1,000 noninvolved workers might experience adverse chemical effects from HF and uranium exposure (mild and temporary effects, such as respiratory irritation or temporary decrease in kidney function).

Accident Categories and Frequency Ranges

Likely: Accidents estimated to occur one or more times in 100 years of facility operations (frequency $\geq 1 \times 10^{-2}$/yr).

Unlikely: Accidents estimated to occur between once in 100 years and once in 10,000 years of facility operations (frequency = from 1×10^{-2}/yr to 1×10^{-4}/yr).

Extremely Unlikely: Accidents estimated to occur between once in 10,000 years and once in 1 million years of facility operations (frequency = from 1×10^{-4}/yr to 1×10^{-6}/yr).

Incredible: Accidents estimated to occur less than one time in 1 million years of facility operations (frequency < 1×10^{-6}/yr).

The postulated cylinder accident that would result in the largest number of persons with irreversible adverse health effects is a corroded cylinder spill under wet conditions. If this accident occurred, it is estimated that 1 member of the general public and up to 140 noninvolved workers might experience irreversible adverse effects (such as lung damage or kidney damage). No fatalities are expected among members of the general public; there would be a potential for 1 fatality among noninvolved workers from chemical effects. Radiation exposures would be unlikely to result in additional LCFs among noninvolved workers (1 chance in 100) or the general public (1 chance in 30).

In addition to the cylinder accidents discussed above is a certain class of accidents that the DOE investigated; however, because of security concerns, information about such accidents is not available for public review but is presented in a classified appendix to the EIS. All classified information will be presented to appropriate state and local officials for their review and comment.

The number of persons actually experiencing adverse or irreversible adverse effects from cylinder accidents would likely be considerably fewer than those estimated for this analysis and would depend on the actual circumstances of the accident and the individual chemical sensitivities of the affected persons. For example, although exposures to releases from cylinder accidents could be life-threatening (especially with respect to immediate effects from HF inhalation), the guideline exposure level of 20 parts per million (ppm) of HF used to estimate the potential for irreversible adverse effects from HF exposure is likely to result in overestimates. This is because no animal or human deaths have been known to occur as a result of acute exposures (i.e., 1 hour or less) at concentrations of less than 50 ppm; generally, if death does not occur quickly after HF exposure, recovery is complete.

Similarly, the guideline intake level of 30 mg used to estimate the potential for irreversible adverse effects from the intake of uranium in this EIS is the level suggested in NRC guidance. This level is somewhat conservative; that is, it is intended to overestimate rather than underestimate the potential number of irreversible adverse effects in the exposed population following uranium exposure. In more than 40 years of cylinder handling activities, no accidents involving releases from cylinders containing *solid* UF_6 have occurred that have caused diagnosable irreversible adverse effects among workers. In previous accidental exposure incidents involving *liquid* UF_6 in gaseous diffusion plants, some worker fatalities occurred immediately after the accident as a result of inhalation of HF generated from the UF_6. However, no fatalities occurred as a result of the toxicity of the uranium exposure. A few workers were exposed to amounts of uranium estimated to be about three times the guideline level (30 mg) used for assessing irreversible adverse effects; none of these workers, however, actually experienced such effects.

Under the action alternatives, low-probability accidents involving chemicals at the conversion facility could have large potential consequences for noninvolved workers and members of the general public. At a conversion site, accidents involving chemical releases, such as NH_3 and HF, could occur. NH_3 is used to generate hydrogen for conversion, and HF can be produced as a co-product of converting DUF_6. Although the use of NH_3 for hydrogen production is currently part of the UDS design, the use of natural gas for hydrogen production, which would eliminate the need for NH_3, is being investigated.

The conversion accident estimated to have the largest potential consequences is an accident involving the rupture of tanks containing either 70% HF or anhydrous NH_3. Such an accident could be caused by a large earthquake and is expected to occur with a frequency of less than once in 1 million years of operations. The probability of this type of accident occurring during the operation of a conversion facility is a function of the period of operation; over 18 years of operations, the accident probability would be less than 1 chance in 56,000.

If an aqueous HF or anhydrous NH_3 tank ruptured at the conversion facility, a maximum of up to about 2,300 members of the general public might experience adverse effects (mild and temporary effects, such as respiratory irritation or temporary decrease in kidney function) as a result of chemical exposure. A maximum of about 210 people might experience irreversible adverse effects (such as lung damage or kidney damage), with the potential for about 4 fatalities. With regard to noninvolved workers, up to about 1,400 workers might experience adverse effects (mild and temporary) as a result of chemical exposures. A maximum of about 1,400 noninvolved workers might experience irreversible adverse effects, with the potential for about 30 fatalities.

The location of the conversion facility within the Portsmouth site would affect the number of noninvolved workers and the general public who might experience adverse or irreversible adverse effects from an HF or anhydrous NH_3 tank rupture accident. However, the differences among the locations within each site would generally be small and within the uncertainties associated with the exact accident sequence and weather conditions at the time of the accident. An exception would be that the number of noninvolved workers impacted would be higher for Location B for both potential adverse and irreversible adverse effects.

Although such high-consequence accidents at a conversion facility are possible, they are expected to be extremely rare. The risk (defined as consequence × probability) for these accidents would be zero fatalities and zero irreversible adverse health effects expected for noninvolved workers and members of the public combined. NH_3 and HF are commonly used for industrial applications in the United States, and there are well-established accident prevention and mitigative measures for HF and NH_3 storage tanks. These include storage tank siting principles, design recommendations, spill detection measures, and containment measures. These measures would be implemented, as appropriate.

Under the action alternatives, the highest consequence radiological accident is estimated to be an earthquake damaging the depleted U_3O_8 product storage building. If this accident occurred, it is estimated that about 135 lb (61 kg) of depleted U_3O_8 would be released to the atmosphere outside of the building. The collective dose received by the general public and the noninvolved workers would be about 30 person-rem and 400 person-rem, respectively. There would be about a 1-in-50 chance of an LCF among the general public and a 1-in-5 chance of an LCF among the noninvolved workers. Because the accident has a probability of occurrence that is about 1 chance in 6,000, the risk posed by the accident would be essentially zero LCFs among both the public and the workers.

S.5.3 Human Health and Safety — Transportation

Under the no action alternative, only small amounts of the LLW and low-level radioactive mixed waste (LLMW) that would be generated during routine cylinder maintenance activities would require transportation (about one shipment per year). Only negligible impacts are expected from such shipments. No DU_6 or non-DU_6 cylinders would be transported between sites.

Under the action alternatives, the total number of shipments would include the following:

1. Approximately 8,800 truck shipments or 2,200 railcar shipments of depleted U_3O_8 from the conversion facility to Envirocare or NTS, if U_3O_8 was disposed of in bulk bags. The numbers of shipments would be about 10,500 for trucks or 4,200 for railcars if the emptied cylinders were used as disposal containers.

2. About 8,200 truck or 1,680 railcar shipments of aqueous (70% and 49%) HF could occur; alternatively, the aqueous HF could be neutralized to CaF_2, requiring a total of about 13,600 truck or 3,400 railcar shipments. Currently, the destination for these shipments is not known.

3. About 700 truck or 350 railcar shipments of anhydrous NH_3 from a supplier to the site. Currently, the origin of these shipments is not known.

4. Emptied heel cylinders to Envirocare or NTS, if bulk bags were used to dispose of the depleted U_3O_8.

5. Approximately 5,400 truck or 1,400 railcar shipments of cylinders from ETTP to Portsmouth.

During normal transportation operations, radioactive material and chemicals would be contained within their transport packages. Health impacts to crew members (i.e., workers) and members of the general public along the routes could occur if they were exposed to low-level external radiation in the vicinity of uranium material shipments. In addition, exposure to vehicle emissions (engine exhaust and fugitive dust) could potentially cause latent fatalities from inhalation.

The risk estimates for emissions are based on epidemiological data that associate mortality rates with particulate concentrations in ambient air. (Increased latent mortality rates resulting from cardiovascular and pulmonary diseases have been linked to incremental increases in particulate concentrations.) Thus, the increase in ambient air particulate concentrations caused by a transport vehicle, with its associated fugitive dust and diesel exhaust emissions, is related to such premature latent fatalities in the form of risk factors. Because of the conservatism of the assumptions made to reconcile results among independent epidemiological studies and associated uncertainties, the latent fatality risks estimated for normal vehicle emissions should be considered to be an upper bound.[2] For the transport of conversion products and co-products (depleted U_3O_8, aqueous HF, and emptied cylinders, if not used as disposal containers), it is conservatively estimated that a total of about 8 fatalities from vehicle emissions could occur if shipments were only by truck and if aqueous HF product was sold and transported 620 mi

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[2] For perspective, in a recently published EIS for a geologic repository at Yucca Mountain, Nevada, the same risk factors were used for vehicle emissions; however, they were adjusted to reduce the amount of conservatism in the estimated health impacts. As reported in the Yucca Mountain EIS, the adjustments resulted in a reduction in the emission risks by a factor of about 30.

(1,000 km) from the site (about 17 fatalities are estimated if HF was neutralized to CaF_2 and transported 620 mi [1,000 km] from the site). The number of fatalities occurring from exhaust emissions if shipment were only by rail would be less than 1 if the HF was sold and about 1 if the HF was neutralized to CaF_2.

Exposure to external radiation during normal transportation operations is estimated to cause less than 1 LCF under both truck and rail options. Members of the general public living along truck and rail transportation routes would receive extremely small doses of radiation from shipments, less than 0.05 mrem over the duration of the program. This would be true even if a single person was exposed to every shipment of radioactive material during the program.

Traffic accidents could occur during the transportation of radioactive materials and chemicals. These accidents could potentially affect the health of workers (i.e., crew members) and members of the general public, either from the accident itself or from accidental releases of radioactive materials or chemicals.

The total number of traffic fatalities (unrelated to the type of cargo) was estimated on the basis of national traffic statistics on shipments by both truck and rail. If the aqueous HF was sold, about 1 traffic facility would be estimated under both transportation modes. If HF was neutralized to CaF_2, about 2 fatalities would be estimated for the truck option and 1 fatality for the rail option.

Severe transportation accidents could also result in a release of radioactive material or chemicals from a shipment. The consequences of such a release would depend on the material released, location of the accident, and atmospheric conditions at the time. Potential consequences would be greatest in urban areas because more people could be exposed. Accidents that occurred when the atmospheric conditions were very stable (typical of nighttime) would have higher potential consequences than accidents that occurred when the conditions were unstable (i.e., turbulent, typical of daytime) because the stability would determine how quickly the released material dispersed and diluted to lower concentrations as it moved downwind.

For the action alternatives, the highest potential accident consequences during transportation activities would be caused by a rail accident involving anhydrous NH_3. Although anhydrous NH_3 is a hazardous gas, it has many industrial applications and is commonly safely transported by industry as a pressurized liquid in trucks and rail tank cars.

The ocurrence of a severe anhydrous NH_3 railcar accident in a highly populated urban area under stable atmospheric conditions is extremely rare. The probability of such an accident occurring if all the anhydrous NH_3 needed was transported 620 mi (1,000 km) is estimated to be less than 1 chance in 400,000. Nonetheless, if such an accident (i.e., release of anhydrous NH_3 from a railcar in a densely populated urban area under stable atmospheric conditions) occurred, up to 5,000 persons might experience irreversible adverse effects (such as lung damage), with the potential for about 100 fatalities. If the same type of NH_3 rail accident occurred in a typical rural area, which would have a smaller population density than an urban area, potential impacts would be considerably less. It is estimated that in a rural area, approximately 20 persons might experience irreversible adverse effects, with no expected fatalities. The atmospheric conditions at the time of an accident would also significantly affect the consequences of a severe NH_3 accident. The consequences of an NH_3 accident would be less severe under unstable conditions, the most likely conditions in the daytime. Unstable conditions would result in more rapid dispersion of the airborne NH_3 plume and lower downwind concentrations. Under unstable conditions in an urban area, approximately 400 persons could experience irreversible adverse effects, with the potential for about 8 fatalities. If the accident occurred in a rural area under unstable conditions, 1 person would be expected to experience an irreversible adverse effect, with zero fatalities expected. When the probability of an NH_3 accident occurring is taken into account, it is expected that no irreversible adverse effects and no fatalities would occur over the shipment period.

For perspective, anhydrous NH_3 is routinely shipped commercially in the United States for industrial and agricultural applications. On the basis of information provided in the DOT *Hazardous Material Incident System (HMIS) Database* for 1990 through 2002, 2 fatalities and 19 major injuries to the public or to transportation or emergency response personnel have occurred as a result of anhydrous NH_3 releases during truck and rail operations. These fatalities and injuries occurred during transportation or loading and unloading operations. Over that period, truck and rail NH_3 spills resulted in more than 1,000 and 6,000 evacuations, respectively. Five very large spills, more than 10,000 gal (38,000 L), have occurred; however, these spills were all en route derailments from large rail tank cars. The two largest spills, both around 20,000 gal (76,000 L), occurred in rural or lightly populated areas and resulted in 1 major injury. Over the past 30 years, the safety record for transporting anhydrous NH_3 has significantly improved. Safety measures contributing to this improved safety record include the installation of protective devices on railcars, fewer derailments, closer manufacturer supervision of container inspections, and participation of shippers in the Chemical Transportation Emergency Center.

After anhydrous NH_3, the types of accidents that are estimated to result in the second highest consequences are those involving shipment of 70% aqueous HF produced during the conversion process. The estimated numbers of irreversible adverse effects for 70% HF rail accidents are about one-third of those from the anhydrous NH_3 accidents. However, the number of estimated fatalities is about one-sixth of those from NH_3 accidents, because the percent of fatalities among the individuals experiencing irreversible adverse effects is 1% as opposed to 2% for NH_3 exposures. For perspective, since 1971, the period covered by DOT records, no fatal or serious injuries to the public or to transportation or emergency response personnel have occurred as a result of anhydrous HF releases during transportation. (Most of the HF transported in the United States is anhydrous HF, which is more hazardous than aqueous HF.) Over that period, 11 releases from railcars were reported to have no evacuations or injuries associated with them. The only major release (estimated at 6,400 lb [29,000 kg] of HF) occurred in 1985 and resulted in approximately 100 minor injuries. Another minor HF release during transportation occurred in 1990. The safety record for transporting anhydrous HF has improved in the past 10 years for the same reasons as those discussed above for NH_3.

S.5.4 Air Quality and Noise

Under the no action alternative, air quality from construction and operations would be within national and state ambient air quality standards. If continued cylinder maintenance and painting are effective in controlling corrosion, as expected, concentrations of HF would be kept within regulatory standards at the Portsmouth and ETTP sites. If cylinder corrosion was not controlled, the maximum 24-hour HF concentration at the ETTP site boundary could be about equal to the Tennessee primary standard of 2.9 $\mu g/m^3$ around the year 2020. However, because of the on-going cylinder maintenance program, it is not expected that this high breach rate would occur at the ETTP site.

Under the action alternatives, air quality impacts during construction were found to be similar for all three alternative locations. The total (modeled plus the measured background value representative of the site) concentrations due to emissions of most criteria pollutants — such as sulfur dioxide (SO_2), nitrogen oxides (NO_x), and carbon monoxide (CO) — would be well within applicable air quality standards. As is often the case for construction, the primary concern would be particulate matter (PM) released from near-ground-level sources. Total concentrations of PM_{10} and $PM_{2.5}$ (PM with an aerodynamic diameter of 10 µm or less and 2.5 µm or less, respectively) at the construction site boundaries would be close to or above the standards because of the high background concentrations and the proximity of the new cylinder yard and the proposed conversion facility to potentially publicly accessible areas. Accordingly, construction activities should be conducted so as to minimize further impacts on ambient air quality. To mitigate impacts, water could be sprayed on disturbed areas more often, and dust suppressant or pavement could be applied to roads with frequent traffic.

During operations, it is estimated that total concentrations for all annual average criteria pollutants except $PM_{2.5}$ would be well within standards. The background level of $PM_{2.5}$ in the area of the Portsmouth site approaches or already exceeds the standard. Again, impacts during operations were found to be similar for all three alternative locations.

Noise impacts are expected to be negligible under the no action alternative. Under the action alternatives, estimated noise levels at the nearest residence (located 0.9 km [0.6 mi] from the alternative locations) would be below the U.S. Environmental Protection Agency (EPA) guideline of 55 dB(A)[3] as day-night average sound level (DNL)[4] for residential zones during construction and operations.

[3] dB(A) is a unit of weighted sound-pressure level, measured by the use of the metering characteristics and the A-weighting specified in the *American National Standard Specification for Sound Level Meters*, ANSI S1.4-1983, and in Amendment S1.4A-1985.

[4] DNL is the 24-hour average sound level, expressed in dB(A), with a 10-dB penalty artificially added to the nighttime (10 p.m.–7 a.m.) sound level to account for noise-sensitive activities (e.g., sleep) during these hours.

S.5.5 Water and Soil

Under the no action alternative, uranium concentrations in surface water, groundwater, and soil would remain below guidelines throughout the project duration. However, if cylinder maintenance and painting were not effective in reducing cylinder corrosion rates, the uranium concentration in groundwater could be greater than the guideline at both the Portsmouth and ETTP sites at some time in the future (no earlier than about 2100). If continued cylinder maintenance and painting were effective in controlling corrosion, as expected, groundwater uranium concentrations would remain less than the guideline.

During construction of the conversion facility, construction material spills could contaminate surface water, groundwater, or soil. However, by implementing storm water management, erosion control, and good construction practices, concentrations in soil and wastewater (and therefore surface water and groundwater) could be kept well within applicable standards or guidelines.

During operations, no appreciable impacts on surface water, groundwater, or soils would result from the conversion facility because no contaminated liquid effluents are anticipated, and because airborne emission would be at very low levels (e.g., <0.25 g/yr of uranium). Impacts among the three alternative locations would be similar.

S.5.6 Socioeconomics

The socioeconomic analysis evaluates the effects of construction and operation of a new cylinder yard and conversion facility on population, employment, income, regional growth, housing, and community resources in the region of influence (ROI) around the site. In general, socioeconomic impacts tend to be positive, creating jobs and income, with only minor impacts on housing, public finances, and employment in local public services.

The no action alternative would result in a small socioeconomic impact at both the Portsmouth and ETTP sites combined, creating a total of 130 jobs during operations (direct and indirect jobs) and generating a total of $6.1 million in personal income per operational year. No significant impacts on regional growth and housing, local finances, and public service employment in the ROI are expected.

Under the action alternatives, jobs and income would be generated during both construction and operation. Construction of the conversion facility would create 310 jobs and generate $11 million in personal income in the peak construction year (construction occurs over a 2-year period). Operation of the conversion facility would create 320 jobs and generate $13 million in personal income each year. No significant impacts on regional growth and housing, local finances, and public service employment in the ROI are expected. The socioeconomic impacts are not dependent on the location of the conversion facility; therefore, the impacts would be the same for alternative Locations A, B, and C.

S.5.7 Ecology

Under the no action alternative, continued cylinder maintenance and surveillance activities would have negligible impacts on ecological resources (i.e., vegetation, wildlife, threatened and endangered species). No yard reconstruction is planned for either the Portsmouth or ETTP sites. It is estimated that potential concentrations of contaminants in the environment from future cylinder breaches would be below levels harmful to biota. However, there is a potential for impacts to aquatic biota from cylinder yard runoff during painting activities.

For the action alternatives, the total area disturbed during conversion facility construction would be 65 acres (26 ha). Vegetation communities would be impacted in this area with a loss of habitat. However, for all three alternative locations, impacts could be minimized depending on exactly where the facility was placed within each location. These habitat losses would constitute less than 1% of available land at the site. It was found that concentrations of contaminants in the environment during operations would be below harmful levels. Negligible impacts to vegetation and wildlife are expected at all locations.

Wetlands at or near Locations A, B, and C could be adversely affected at the Portsmouth site. Impacts to wetlands could be minimized depending on where exactly the facility was placed within each location. Unavoidable impacts to wetlands would require a Clean Water Act (CWA) Section 404 Permit from the U.S. Army Corps of Engineers; permits from the State of Ohio; and CWA Section 401 water quality certification from Ohio. Mitigative measures, possibly including compensatory mitigation, might be stipulated in these permits. A mitigation plan might be required prior to the initiation of construction.

Construction of the conversion facility should not directly affect federal- or state-listed species. However, impacts on deciduous forest might occur. Impacts to forested areas could be avoided if temporary construction areas were placed in previously disturbed locations. Trees with exfoliating bark, such as shagbark hickory or dead trees with loose bark, can be used by the Indiana bat (federal- and state-listed as endanagered) as roosting trees during the summer. There is a potential that such trees could be disturbed during construction at Locations A or C at Portsmouth. If either live or dead trees with exfoliating bark are encountered on construction areas, they should be saved if possible. If necessary, the trees should be cut before April 15 or after September 15.

S.5.8 Waste Management

Under the no action alternative, LLW and LLMW would be generated from cylinder scraping and painting activities. The amount of LLW and LLMW generated would represent an increase of less than 1% in the sites' loads of these wastes, representing negligible impacts on site waste management operations.

Under the action alternatives, waste management impacts would not depend on the location of the facility within the site and would be the same for alternative Locations A, B, and C. Waste generated during construction and operations would have negligible impacts on the

Portsmouth site waste management operations, with the exception of possible impacts from disposal of CaF_2. Industrial experience indicates that HF, if produced, would contain only trace amounts of depleted uranium (less than 1 ppm). It is expected that HF would be sold for use. If sold for use, the sale would be subject to review and approval by DOE in coordination with the NRC, depending on the specific use (as discussed in Appendix E of this EIS).

The U_3O_8 produced during conversion would generate about 4,700 yd^3 (3,570 m^3) per year of LLW. This is 5% of Portsmouth's annual projected volume and would have a low impact on site LLW management.

If the HF was not sold but instead neutralized to CaF_2, it is currently unknown whether (1) the CaF_2 could be sold, (2) the low uranium content would allow the CaF_2 to be disposed of as nonhazardous solid waste, or (3) disposal as LLW would be required. The low level of uranium contamination expected (i.e., less than 1 ppm) suggests that sale or disposal as nonhazardous solid waste would be most likely. If sold for use, the sale would be subject to review and approval by DOE in coordination with the NRC, depending on the specific use. Waste management for disposal as nonhazardous waste could be handled through appropriate planning and design of the facilities. If the CaF_2 had to be disposed of as LLW, it could represent a potentially large impact on waste management operations.

A small quantity of TRU could be entrained in the gaseous DUF_6 during the cylinder emptying operations. These contaminants would be captured in the filters between the cylinders and the conversion equipment. The filters would be monitored and replaced routinely to prevent buildup of TRU. The spent filters would be disposed of as LLW, generating up to 25 drums of LLW waste over the life of the project.

Current UDS plans are to leave the heels in the emptied cylinders, add a stabilizer, and either (1) crush the cylinders and dispose of them at either Envirocare or NTS or (2) use the cylinders as disposal containers for the U_3O_8 product. Either one of these approaches is expected to meet the waste acceptance criteria of the disposal facilities and minimize the potential for generating TRU waste through washing of the cylinders to remove the heels. Although cylinder washing is not considered a foreseeable option at this time, for completeness, an analysis of the maximum potential quantities of TRU waste that could be generated from cylinder washing is included in Appendix B of this EIS.

S.5.9 Resource Requirements

Resource requirements include construction materials, fuel, electricity, process chemicals, and containers. In general, all alternatives would have a negligible effect on the local or national availability of these resources.

S.5.10 Land Use

Under the no action alternative, all activities would occur in areas previously used for conducting similar activities; therefore, no land use impacts are expected. Under the action alternatives, a total of 65 acres (26 ha) could be disturbed for the conversion facility, with some areas cleared for railroad or utility access and not adjacent to the construction site. Up to 6.3 additional acres (2.5 ha) could also be disturbed for construction of a new cylinder yard. All three alternative locations are within an already-industrialized facility, and impacts to land use would be similar for the three locations. The permanently altered areas represent less than 1% of available land already developed for industrial purposes. Negligible impacts on land use are thus expected.

S.5.11 Cultural Resources

Under the no action alternative, impacts on cultural resources at the current storage locations would be unlikely because all activities would occur in areas already dedicated to cylinder storage. Under the action alternatives, impacts on cultural resources would be possible for all three alternative locations. Archaeological and architectural surveys have not been finalized for the candidate locations and must be completed prior to initiation of the action alternatives. However, if archaeological resources were encountered, or historical or traditional cultural properties were identified, a mitigation plan would be required.

S.5.12 Environmental Justice

No disproportionately high and adverse human health or environmental impacts are expected to minority or low-income populations during normal facility operations under the action alternatives. Although the consequences of facility accidents could be high if severe accidents occurred, the risk of irreversible adverse effects (including fatalities) among members of the general public from these accidents (taking into account the consequences and probability of the accidents) would be less than 1. Furthermore, transportation accidents with high and adverse impacts are unlikely; their locations cannot be projected, and the types of persons who would be involved cannot be reliably predicted. Thus, there is no reason to expect that minority and low-income populations would be affected disproportionately by high and adverse impacts.

S.5.13 Impacts from Cylinder Preparation at ETTP

The cylinders at ETTP would have to be prepared to be shipped by either truck or rail. Approximately 6,400 cylinders (4,700 DUF_6 cylinders for conversion and about 1,600 non-DUF_6 cylinders) would require preparation for shipment at ETTP. Two cylinder preparation methods are considered for the shipment of noncompliant cylinders: use of cylinder overpacks and use of a cylinder transfer facility.

In general, the use of cylinder overpacks would result in small potential impacts. Overpacking operations would be similar to current cylinder handling operations, and impacts would be limited to involved workers. No LCFs among involved workers from radiation exposure are expected.

The use of a cylinder transfer facility would likely require the construction of a new facility at ETTP; there are no current plans to build such a facility. Operational impacts would generally be small and limited primarily to external radiation exposure of involved workers, with no LCFs expected. Transfer facility operations would generate a large number of emptied cylinders requiring disposition.

If ETTP cylinders were transported to Paducah for conversion, the operational period at Portsmouth would be reduced by 4 years. Annual impacts would be the same as discussed for each technical discipline. No significant decrease in overall impacts would be expected.

S.5.14 Impacts Associated with Conversion Product Sale and Use

During the conversion of the DUF_6 inventory to depleted U_3O_8, products having some potential for reuse are produced. These products include HF and CaF_2, which are commonly used as commercial materials. An investigation of the potential reuse of HF and CaF_2 has been included as part of this EIS. Areas examined include the characteristics of these materials as produced within the conversion process, the current markets for these products, and the potential socioeconomic impacts should these products be provided to the commercial sector. Because there would be some residual radioactivity associated with these materials, the DOE process for authorizing release of materials for unrestricted use (referred to as "free release") and an estimate of the potential human health effects of such free release have also been included in this investigation. The results of the analysis of HF and CaF_2 use are included in Table S-6.

If the products were to be released for restricted use (e.g., in the nuclear industry for the manufacture of nuclear fuel), the impacts would be less than those for unrestricted release.

Conservative estimates of the amount of uranium and technetium that might transfer into the HF and CaF_2 were used to evaluate the maximum expected dose to workers using the material if it was released for commercial use or the general public. On the basis of very conservative assumptions concerning use, the maximum dose to workers was estimated to be less than 1 mrem/yr, much less than the regulatory limit of 100 mrem/yr specified for members of the general public. Doses to the general public would be even lower.

Socioeconomic impact analyses were conducted to evaluate the impacts of the introduction of the conversion-produced HF or CaF_2 into the commercial marketplace. A potential market for the aqueous HF has been identified as the current aqueous HF acid producers. The impact of HF sales on the local economy in which the existing producers are located and on the U.S. economy as a whole is likely to be minimal. No market for the CaF_2 that might be produced in the conversion facility has been identified. Should such a market be found, the impact of CaF_2 sales on the U.S. economy is also predicted to be minimal.

S.5.15 Impacts from D&D Activities

D&D would involve the disassembly and removal of all radioactive and hazardous components, equipment, and structures. For the purposes of analysis in this EIS, it was also assumed that the various buildings would be dismantled and "greenfield" (unrestricted use) conditions would be achieved. D&D impacts to involved workers would be primarily from external radiation; expected exposures would be a small fraction of operational doses; no LCFs would be expected. It is estimated that no fatalities and up to five injuries would result from occupational accidents. Impacts from waste management would include total generation of about 275 yd^3 (210 m^3) of LLW, 157 yd^3 (120 m^3) of LLMW, and 157 yd^3 (120 m^3) of hazardous waste; these volumes would result in low impacts in comparison with projected site annual generation volumes.

S.5.16 Cumulative Impacts

The Council on Environmental Quality (CEQ) guidelines for implementing NEPA define cumulative effects as the impacts on the environment resulting from the incremental impact of an action under consideration when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7) Activities considered for cumulative analysis include those in the vicinity of the Portsmouth site that might affect environmental conditions at or near that locality under both the no action alternative and the proposed action alternatives. Activities considered also include those at the ETTP site associated with transporting cylinders to Portsmouth (under the proposed action) and continued long-term storage of DUF_6 (under the no action alternative). One action considered reasonably foreseeable under cumulative impacts is the development of a uranium enrichment facility at either the Paducah or Portsmouth site. An agreement between USEC and DOE on June 17, 2002, established the possibility of constructing an enrichment plant with an annual production capacity of 1.0 million separative work units at either site. This EIS assumes that such an enrichment facility would be located at Portsmouth (in lieu of a final siting decision), would employ the existing gas centrifuge technology, and would generate impacts similar to those outlined in a 1977 analysis of environmental consequences that considered such an action.

Actions planned at the Portsmouth site include continued waste management activities, waste disposal activities, environmental restoration activities, industrial reuse of sections of the site, and the DUF_6 management activities considered in this EIS. Uranium enrichment activities at Portsmouth were discontinued early in 2002. Cumulative impacts at the Portsmouth site and vicinity would be as follows for the no action alternative and the proposed action alternatives:

- The cumulative radiological exposure to the off-site population would be considerably below the maximum DOE dose limit of 100 mrem per year to the off-site maximally exposed individual (MEI). Annual individual doses to involved workers would be monitored to maintain exposure below the regulatory limit of 5 rem per year.

- Under the no action alternative cumulative impacts assessment, although less than 1 shipment per year of radioactive wastes is expected from cylinder management activities, up to 3,500 rail shipments and 4,500 truck shipments could be associated with existing and planned actions. Under the action alternatives, up to 6,800 rail shipments and 12,300 truck shipments of radioactive material could occur. The cumulative maximum dose to the MEI along the transportation route near the site entrance would be less than 1 mrem/yr under all alternatives for all transportation options considered.

- The Portsmouth site is located in an attainment region. However, the background annual-average $PM_{2.5}$ concentration exceeds the standard. Cumulative impacts would not affect the attainment status.

- Data from the 2000 annual groundwater monitoring showed that five pollutants exceeded primary drinking water regulation levels in groundwater at the Portsmouth site. Alpha and beta activity were also detected. Good engineering and construction practices should ensure that indirect impacts associated with the conversion facility would be minimal.

- Cumulative ecological impacts should be negligible, with little change to intact ecosystems contributed by any alternative considered in this EIS in conjunction with the effects of other activities.

- Impacts on land use similarly would be minimal, with DUF_6 conversion activities confined to the Portsmouth site, which is already heavily developed for such activities.

- It is unlikely that any noteworthy cumulative impacts on cultural resources would occur under any alternative, and any such impacts would be adequately mitigated before activities for the chosen action would continue.

- Given the absence of high and adverse cumulative impacts for any impact area considered in this EIS, no environmental justice cumulative impacts are anticipated for the Portsmouth site, despite the presence of disproportionately high percentages of minority and low-income populations in the vicinity.

- Socioeconomic impacts under all the alternatives considered are anticipated to be generally positive, often temporary, and relatively small.

Actions planned at the ETTP site include continued waste management activities, reindustrialization of the ETTP site, environmental restoration activities, possibly other DOE programs involving the disposition of enriched uranium, and the DUF_6 management activities considered in this EIS. Cumulative impacts at the ETTP site and vicinity would not be large under either the no action or the action alternatives.

S.5.17 Mitigation

On the basis of the analyses conducted for this EIS, the following recommendations can be made to reduce the impacts of the proposed action:

- Current cylinder management activities, including inspecting cylinders, carrying out cylinder maintenance activities (such as painting), and promptly cleaning up releases from any breached DUF_6 cylinders, should be continued to avoid future impacts on site air and groundwater. In addition, runoff from cylinder yards should be collected and sampled so that contaminants can be detected and their release to surface water or groundwater can be avoided. If future cylinder painting results in permit violations, treating cylinder yard runoff prior to release may be required.

- Temporary impacts on air quality from fugitive dust emissions during construction of any new facility should be controlled by the best available practices (e.g., water spraying) to avoid temporary exceedances of the PM_{10} and $PM_{2.5}$ standard.

- During construction, good engineering and construction practices, such as covering chemicals with tarps to prevent interaction with rain, promptly cleaning up any spills, and providing retention basins to catch and hold any contaminated runoff, should be employed to minimize impacts to water quality and soil. Such measures should be addressed in a storm water and erosion control plan.

- Potential impacts to wetlands at the Portsmouth site could be minimized or eliminated by maintaining a buffer near adjacent wetlands during construction and by placing temporary construction areas on previously disturbed areas at the site. If impacts to wetlands are unavoidable, compensatory mitigation might be required.

- If trees (either live or dead) with exfoliating bark were encountered on construction areas, they should be saved if possible to avoid destroying potential habitat for the Indiana bat. If necessary, the trees should be cut before April 15 or after September 15.

- The quantity of radioactive and hazardous materials stored on site, including the products of the conversion process, should be minimized.

- The construction of a DUF_6 conversion facility at Portsmouth would have the potential to impact cultural resources. Neither an archaeological nor an architectural survey has been completed for the Portsmouth site as a whole or for any of the alternative locations, although an archaeological sensitivity study has been conducted. In accordance with Section 106 of the National

Historic Preservation Act, the adverse effects of this undertaking must be evaluated once a location is chosen.

- The nuclear properties of DUF_6 are such that the occurrence of a nuclear criticality is not a concern, regardless of the amount of DUF_6 present. However, criticality is a concern for the handling, packaging, and shipping of LEU-UF_6. For LEU-UF_6, criticality control is accomplished by employing, individually or collectively, specific limits on uranium-235 enrichment, mass, volume, geometry, moderation, and spacing for each type of cylinder. The amount of LEU-UF_6 that may be contained in an individual cylinder and the total number of cylinders that may be transported together are determined by the nuclear properties of LEU-UF_6. Spacing of LEU-UF_6 cylinders in transit during routine and accident conditions is ensured by use of regulatory approval packages that provide protection against impact and fire.

- Because of the relatively high consequences estimated for some accidents, special attention will be given to the design and operational procedures for components that may be involved in such accidents. For example, the tanks holding hazardous chemicals on site such as anhydrous NH_3 and aqueous HF would be designed to all applicable codes and standards, and special procedures would be in place for gaining access to the tanks and for filling of the tanks. In addition, although the probabilities of occurrence for a high-consequence accident are extremely low, emergency response plans and procedures would be in place to respond to any emergencies should an accident occur.

S.5.18 Unavoidable Adverse Impacts

Unavoidable adverse impacts are those impacts that cannot be mitigated by choices associated with siting and facility design options. Such impacts would be unavoidable, no matter which options were selected, and would include the following:

- Exposure of workers to radiation in the storage yards and the conversion facility that would be below applicable standards;

- Generation of vehicle exhaust and particulate air emissions during construction that would result in concentrations of air pollutants below standards;

- Disturbance of up to 65 acres (26 ha) of land during construction, with approximately 10 acres (4 ha) required for the facility footprint;

- Loss of terrestrial and aquatic habitats from construction and disturbance of wildlife during operations; and

- Generation of vehicle exhaust and particulate air emissions during transportation.

S.5.19 Irreversible and Irretrievable Commitment of Resources

A commitment of a resource is considered *irreversible* when the primary or secondary impacts from its use limit the future options for its use. An *irretrievable* commitment refers to the use or consumption of a resource that is neither renewable nor recoverable for later use by future generations. The major irreversible and irretrievable commitment of natural and man-made resources related to the alternatives analyzed in this EIS include the land used to dispose of any conversion products, energy usage, and materials used for construction of the facility that could not be recovered or recycled.

S.5.20 Relationship between Short-Term Use of the Environment and Long-Term Productivity

Disposal of solid nonhazardous waste resulting from new facility construction, operations, and D&D would require additional land at a sanitary landfill site, which would be unavailable for other uses in the long term. Any radioactive or hazardous waste generated by the various alternatives would involve the commitment of associated land, transportation, and disposal resources, and resources associated with the processing facilities for waste management. For the construction and operation of the conversion facility, the associated construction activities would result in both short-term and long-term losses of terrestrial and aquatic habitats from natural productivity. After closure of the new facility, it would be decommissioned and could be reused, recycled, or remediated.

S.5.21 Pollution Prevention and Waste Minimization

Implementation of the EIS alternatives would be conducted in accordance with all applicable pollution prevention and waste minimization guidelines. A consideration of opportunities for reducing waste generation at the source, as well as for recycling and reusing material, will be incorporated to the extent possible into the engineering and design process for the conversion facility. Pollution prevention and waste minimization will be major factors in determining the final design of any facility to be constructed. Specific pollution prevention and waste minimization measures will be considered in designing and operating the final conversion facility.

S.6 ENVIRONMENTAL AND OCCUPATIONAL SAFETY AND HEALTH PERMITS AND COMPLIANCE REQUIREMENTS

DUF_6 cylinder management as well as construction and operation of the proposed DUF_6 conversion facility would be subject to many federal, state, local, and other legal requirements.

In accordance with such legal requirements, a variety of permits, licenses, and other consents must be obtained. Chapter 6 of this EIS contains a detailed listing of applicable requirements.

S.7 PREFERRED ALTERNATIVE

The preferred alternative is to construct and operate the proposed DUF_6 conversion facility at alternative Location A, which is in the west-central portion of the Portsmouth site.

TABLE S-6 Summary Comparison of Potential Environmental Consequences of the Alternatives[a]

	Proposed Action			No Action	
Environmental Consequence	Location A (Preferred)	Location B	Location C	at Portsmouth	at ETTP
	Human Health and Safety — Normal Facility Operations				
Radiation exposure					
Construction					
New cylinder yard workers	Potential external radiation exposures (above background); estimated individual worker dose of 30 mrem/yr for either Area 1 or Area 2.	Same as Location A	Same as Location A	NA[b]	NA
Conversion facility workers	<60 mrem/yr over a 2-year construction period (if new cylinder yard is located at Area 1).	Background	Background	NA	NA
Operations					
Involved workers					
Average dose to individual involved workers	Conversion facility: 75 mrem/yr Cylinder yards: 510–600 mrem/yr	Same as Location A	Same as Location A	600 mrem/yr	410 mrem/yr
Collective dose to involved workers	Conversion facility: 9.8 person-rem/yr Cylinder yards: 3 person-rem/yr	Same as Location A	Same as Location A	11.5 person-rem/yr	5 person-rem/yr

TABLE S-6 (Cont.)

	Proposed Action			No Action	
Environmental Consequence	Location A (Preferred)	Location B	Location C	at Portsmouth	at ETTP
Total health effects among involved workers for the life of the project (through 2039 for no action)	1 in 10 chance of 1 latent cancer fatality (LCF)	Same as Location A	Same as Location A	1 in 5 chance of 1 LCF	1 in 12 chance of 1 LCF
Noninvolved workers					
Maximum dose to noninvolved worker maximally exposed individual (MEI)	$<5.5 \times 10^{-6}$ mrem/yr	Same as Location A	Same as Location A	0.15 mrem/yr	0.048 mrem/yr
Collective dose to noninvolved workers	$<9.9 \times 10^{-6}$ person-rem/yr	Same as Location A	Same as Location A	0.001 person-rem/yr	0.0005 person-rem/yr
Total health effects among noninvolved workers for the life of the project (through 2039 for no action)	<1 in 1 million chance of 1 LCF	Same as Location A	Same as Location A	<1 in 50,000 chance of 1 LCF	<1 in 100,000 chance of 1 LCF
General public					
Maximum dose to the general public MEI	$<2.1 \times 10^{-5}$ mrem/yr	Same as Location A	Same as Location A	<0.1 mrem/yr (during storage) <0.4 mrem/yr (long-term)	<0.2 mrem/yr (during storage) <0.5 mrem/yr (long-term)
Collective dose to general public within 50 mi (80 km)	6.2×10^{-5} person-rem/yr	Same as Location A	Same as Location A	0.002 person-rem/yr	0.005 person-rem/yr
Total health effects among members of the public over the life of the project (through 2039 for no action)	<1 in 1 million chance of 1 LCF	Same as Location A	Same as Location A	<1 in 25,000 chance of 1 LCF	<1 in 10,000 chance of 1 LCF

TABLE S-6 (Cont.)

	Proposed Action			No Action	
Environmental Consequence	Location A (Preferred)	Location B	Location C	at Portsmouth	at ETTP
Chemical exposure of concern[c] (concern = hazard index >1)					
Noninvolved worker MEI	Well below levels expected to cause health effects (hazard index <0.1).	Same as Location A	Same as Location A	Well below levels expected to cause health effects (hazard index <0.1).	Well below levels expected to cause health effects (hazard index <0.1).
General public MEI	Well below levels expected to cause health effects (hazard index <0.1).	Same as Location A	Same as Location A	Well below levels expected to cause health effects (hazard index <0.1).	Well below levels expected to cause health effects (hazard index <0.1).
Human Health and Safety — Facility Accidents[d]					
Physical hazards (involved and noninvolved workers)					
Construction: on-the-job fatalities and injuries	Conversion facility: 0 fatalities; 11 injuries Cylinder yards: 0 fatalities; 1 injury	Same as Location A	Same as Location A	NA	NA
Operations: on-the-job fatalities and injuries	0 fatalities/yr; 8 injuries/yr	Same as Location A	Same as Location A	0 fatalities/yr; 1 injury/yr	0 fatalities/yr; 0.7 injury/yr

TABLE S-6 (Cont.)

	Proposed Action			No Action	
Environmental Consequence	Location A (Preferred)	Location B	Location C	at Portsmouth	at ETTP
Accidents involving chemical or radiation releases, low frequency-high consequence accidents					
Bounding chemical accidents	Hydrogen fluoride (HF) tank rupture (high for adverse effects); anhydrous ammonia (NH_3) tank rupture (high for irreversible adverse effects).	Same as Location A	Same as Location A	Cylinder ruptures – fire (high for adverse effects); corroded cylinder spill, wet conditions (high for irreversible adverse effects).	Cylinder ruptures – fire (high for adverse effects); corroded cylinder spill, wet conditions (high for irreversible adverse effects).
Release amounts	25,680 lb (11,600 kg) of HF; 29,500 lb (13,400 kg) of NH_3	Same as Location A	Same as Location A	24,000 lb (11,000 kg) of DUF_6 (fire); 96 lb (44 kg) of HF (spill, wet conditions)	24,000 lb (11,000 kg) of DUF_6 (fire); 96 lb (44 kg) of HF (spill, wet conditions)
Estimated frequency	<1 time in 1,000,000 years	Same as Location A	Same as Location A	≈1 time in 100,000 years (both accidents)	≈1 time in 100,000 years (both accidents)
Probability – life of the project (through 2039 for no action)	<1 chance in 56,000	Same as Location A	Same as Location A	≈1 in 2,500	≈1 in 2,500
Consequences (per accident)[e]					
Chemical exposure – public					
Adverse effects	29–2,200 persons	30–2,000 persons	33–2,300 persons	4–680 persons	640 persons
Irreversible adverse effects	2–200 persons	2–210 persons	4–210 persons	0–1 person	0 persons
Fatalities	0–4 persons	0–4 persons	0–4 persons	0 persons	0 persons
Chemical exposure – noninvolved workers[f]					
Adverse effects	580–810 persons	880–1,400 persons	850–1,100 persons	160–1,000 persons	770 persons
Irreversible adverse effects	390–810 persons	370–1,400 persons	50–1,100 persons	0–110 persons	140 persons
Fatalities	0–20 persons	0–30 persons	0–20 persons	0–1 person	0-1 person

TABLE S-6 (Cont.)

	Proposed Action			No Action	
Environmental Consequence	Location A (Preferred)	Location B	Location C	at Portsmouth	at ETTP
Accident risk (consequence × probability)					
General public	0 fatalities	Same as Location A	Same as Location A	0 fatalities	0 fatalities
Noninvolved workers[f]	0 fatalities	Same as Location A	Same as Location A	0 fatalities	0 fatalities
Bounding radiological accident	Earthquake accident damages U_3O_8 storage building containing 6 months' of product	Same as Location A	Same as Location A	Cylinder ruptures – fire	Cylinder ruptures – fire
Release	135 lb (61 kg) of depleted U_3O_8	Same as Location A	Same as Location A	24,000 lb (11,000 kg) of UF_6	24,000 lb (11,000 kg) of UF_6
Estimated frequency	≈1 time in 100,000 years	Same as Location A	Same as Location A	≈1 time in 100,000 years	≈1 time in 100,000 years
Probability – life of the project (through 2039 for no action)	≈1 chance in 6,000	Same as Location A	Same as Location A	≈1 chance in 2,500	≈1 chance in 2,500
Consequences (per accident)					
Radiation exposure – public					
Dose to MEI	1–30 rem	Same as Location A	Same as Location A	13 mrem	13 mrem
Risk of LCF	1 chance in 50			7 in 1 million	7 in 1 million
Total dose to population (within 50 mi [80 km])	7–30 person-rem			34 person-rem	73 person-rem
Total LCFs	1 chance in 50 of 1 LCF	Same as Location A	Same as Location A	1 chance in 50 of 1 LCF	1 chance in 30 of 1 LCF
Radiation exposure – noninvolved workers[f]					
Dose to MEI	1–30 rem	Same as Location A	Same as Location A	20 mrem	20 mrem
Risk of LCF	1 chance in 50	Same as Location A	Same as Location A	8 in 1 million	8 in 1 million
Total dose to workers	0.2–400 person-rem	0.2–530 person-rem	0.2–430 person-rem	16 person-rem	16 person-rem
Total LCFs	1 chance in 5 of 1 LCF	1 chance in 5 of 1 LCF	1 chance in 5 of 1 LCF	1 chance in 100 of 1 LCF	1 chance in 100 of 1 LCF

TABLE S-6 (Cont.)

	Proposed Action			No Action	
Environmental Consequence	Location A (Preferred)	Location B	Location C	at Portsmouth	at ETTP
Accident risk (consequence × probability)					
General public	0 LCFs	Same as Location A	Same as Location A	0 LCFs	0 LCFs
Noninvolved workers[f]	0 LCFs	Same as Location A	Same as Location A	0 LCFs	0 LCFs
Human Health and Safety — Transportation					
Transportation impacts during normal operations					
Total fatalities from exposure to vehicle exhaust emissions					
Maximum use of truck	8 (17 if HF is neutralized to calcium fluoride [CaF_2] for disposal)	Same as Location A	Same as Location A	Negligible impacts due to small number of shipments (1 per year) and low concentration of expected contamination.	Negligible impacts due to small number of shipments (1 per year) and low concentration of expected contamination.
Maximum use of rail	<1 (including CaF_2)	Same as Location A	Same as Location A	Negligible	Negligible
Total fatalities from exposure to external radiation					
Maximum use of truck	<1	Same as Location A	Same as Location A	Negligible	Negligible
Maximum use of rail	<1	Same as Location A	Same as Location A	Negligible	Negligible
Maximum radiation exposure to a person along a route (MEI)	Negligible (<0.05 mrem)	Same as Location A	Same as Location A	Negligible	Negligible

TABLE S-6 (Cont.)

	Proposed Action			No Action	
Environmental Consequence	Location A (Preferred)	Location B	Location C	at Portsmouth	at ETTP
Traffic accident fatalities (life of project); (physical hazards, unrelated to cargo)					
Maximum use of trucks	1 (2 if HF is neutralized to CaF_2 for disposal)	Same as Location A	Same as Location A	Negligible	Negligible
Maximum use of rail	1 (including CaF_2)	Same as Location A	Same as Location A	Negligible	Negligible
Traffic accidents involving radiation or chemical releases					
Low frequency-high consequence cylinder accidents					
Bounding accident scenario	Urban rail accident involving DUF_6 cylinders	Same as Location A	Same as Location A	NA	NA
Release	Uranium, HF	Same as Location A	Same as Location A	NA	NA
Probability – life of the project	About 1 chance in 140,000	Same as Location A	Same as Location A	NA	NA
Consequences (per accident)					
Chemical exposure – all workers and members of general public					
Irreversible adverse effects	4	Same as Location A	Same as Location A	NA	NA
Fatalities	0	Same as Location A	Same as Location A	NA	NA

TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action: Location A (Preferred)	Proposed Action: Location B	Proposed Action: Location C	No Action: at Portsmouth	No Action: at ETTP
Radiation exposure – all workers and members of general public					
Total LCFs	60	Same as Location A	Same as Location A	NA	NA
Accident risk (consequence × probability) workers and general public	0 fatalities	Same as Location A	Same as Location A	NA	NA
Low frequency-high consequence accidents with all other materials				NA	NA
Bounding accident scenario	Urban rail accident involving anhydrous NH_3	Same as Location A	Same as Location A	NA	NA
Release	Anhydrous NH_3	Same as Location A	Same as Location A	NA	NA
Probability – life of the project	About 1 chance in 400,000	Same as Location A	Same as Location A	NA	NA
Consequences (per accident)					
Chemical exposure – all workers and members of general public					NA
Irreversible adverse effects	5,000	Same as Location A	Same as Location A	NA	NA
Fatalities	100	Same as Location A	Same as Location A	NA	NA
Accident risk (consequence × probability)					NA
Irreversible adverse effects	0	Same as Location A	Same as Location A	NA	NA
Fatalities	0	Same as Location A	Same as Location A	NA	NA

TABLE S-6 (Cont.)

	Proposed Action			No Action	
Environmental Consequence	Location A (Preferred)	Location B	Location C	at Portsmouth	at ETTP
		Air Quality and Noise			
Pollutant emissions during new cylinder yard construction	Total (modeled plus background) concentrations for particulate matter (PM) with an aerodynamic diameter less than or equal to 2.5 µm ($PM_{2.5}$) would be close to or above standards at the construction site boundary for both candidate areas; construction-related concentrations would be negligible at the nearest residence.	Same as Location A	Same as Location A	NA	NA
Pollutant emissions during conversion facility construction	Total concentrations for PM (PM_{10} and $PM_{2.5}$) would be close to or above standards at the construction site boundary because of high background concentrations; construction-related concentrations would be negligible at the nearest residence. Other criteria pollutants are within standards.	Same as Location A	Same as Location A	NA	NA

TABLE S-6 (Cont.)

	Proposed Action			No Action	
Environmental Consequence	Location A (Preferred)	Location B	Location C	at Portsmouth	at ETTP
Pollutant emissions during conversion facility operations	Total annual-average $PM_{2.5}$ concentration would be above the standard at the site boundary because of high background concentrations; the operations-related concentration would be less than 0.2% of the standard. Other criteria pollutants would be well within standards.	Same as Location A	Same as Location A	Under the controlled cylinder corrosion scenario, the maximum 24-hour HF concentration would be less than 4% of the Kentucky (used for comparison) secondary standard; criteria pollutants would be well within standards.	Under the controlled cylinder corrosion scenario, the maximum 24-hour HF concentration would be less than 23% of the Tennessee primary standard; criteria pollutants would be well within standards.
	No concentration increment would exceed applicable prevention of significant deterioration (PSD) increment at the site boundary (Class II area), and all increments would be well below the PSD increment for the nearest Class I area.	Same as Location A	Same as Location A	Under the uncontrolled cylinder corrosion scenario, the maximum 24-hour HF concentration at the site boundary would be up to 28% of the Kentucky (used for comparison) secondary standard.	Under the uncontrolled cylinder corrosion scenario, the maximum HF concentration at the site boundary would be about equal to the Tennessee primary standard (2.9 $\mu g/m^3$) around the year 2020.

TABLE S-6 (Cont.)

	Proposed Action			No Action	
Environmental Consequence	Location A (Preferred)	Location B	Location C	at Portsmouth	at ETTP
Estimated noise levels at the nearest residence	Below the U.S. Environmental Protection Agency (EPA) guideline of 55 dB(A) as day-night average sound level (DNL) during construction and operation.	Same as Location A	Same as Location A	Below the EPA guideline of 55 dB(A) as DNL during operation.	Below the EPA guideline of 55 dB(A) as DNL during operation.
		Water and Soil			
Surface water					
Construction	Negligible impacts from changes to runoff, from floodplains, or from water use and discharge.	Same as Location A	Same as Location A	NA	NA
Operations	Negligible impacts from water use and discharge.	Same as Location A	Same as Location A	Negligible impacts from water use and discharge.	Negligible impacts from water use and discharge
Groundwater					
Construction	No direct impacts to groundwater recharge, depth, or flow direction; impacts to groundwater quality unlikely.	Same as Location A	Same as Location A	NA	NA

TABLE S-6 (Cont.)

	Proposed Action			No Action	
Environmental Consequence	Location A (Preferred)	Location B	Location C	at Portsmouth	at ETTP
Operations	No direct impacts to groundwater recharge, depth, or flow direction; impacts to groundwater quality unlikely.	Same as Location A	Same as Location A	Under the controlled corrosion case, maximum uranium groundwater concentration (occurring in around 2070) of 5 μg/L, below the guideline of 20 μg/L.[g] Under the uncontrolled corrosion case, cylinder breaches occurring before 2050 could result in groundwater concentrations exceeding the guideline sometime after 2100.	Under the controlled corrosion case, maximum uranium groundwater concentration (occurring in around 2070) of 7 μg/L, below the guideline of 20 μg/L.[g] Under the uncontrolled corrosion case, cylinder breaches occurring before 2025 could result in groundwater concentrations exceeding the guideline sometime after 2100.
Soils					
Construction	Local and temporary increase in erosion; impacts to soil quality unlikely.	Same as Location A	Same as Location A	NA	NA
Operations	No direct impacts to soil.	Same as Location A	Same as Location A	Negligible impacts to soils.	Negligible impacts to soils.

TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action: Location A (Preferred)	Proposed Action: Location B	Proposed Action: Location C	No Action: at Portsmouth	No Action: at ETTP
		Socioeconomics			
New cylinder yard construction	Direct employment of 60 people; 150 total jobs in region of influence (ROI); total personal income of \$4.9 million; no significant impacts on public services. Less than 1-year duration of impacts.	Same as Location A	Same as Location A	NA	NA
Conversion facility construction	Direct employment of 130 people in peak year; 310 total jobs in ROI; total personal income of \$11 million in peak year; no significant impacts on public services. Two-year duration of impacts.	Same as Location A	Same as Location A	NA	NA
Operations	Direct employment of 160 people; 320 total jobs in ROI; total personal income of \$13 million per year of operations; no significant impacts on public services.	Same as Location A	Same as Location A	Direct employment of 20 people; 40 total jobs in ROI; personal income of \$1.2 million per year through 2039; no significant impacts on public services.	Direct employment of 30 people; 90 total jobs in ROI; personal income of \$4.9 million per year through 2039; no significant impacts on public services.

TABLE S-6 (Cont.)

	Proposed Action			No Action	
Environmental Consequence	Location A (Preferred)	Location B	Location C	at Portsmouth	at ETTP
		Ecology			
Ecological resources (habitat loss, vegetation, wildlife)	Total area disturbed during new cylinder yard construction: 5.5 acres (2.2 ha) – Area 1; 6.3 acres (2.5 ha) – Area 2. Total area disturbed during conversion facility construction: 65 acres (26 ha). Vegetation and wildlife communities impacted and potential loss of habitat; impacts could be minimized by facility placement.	Same as Location A	Same as Location A	Negligible impact to ecological resources; all activities would occur in previously developed areas.	Negligible impact to ecological resources; all activities would occur in previously developed areas.
Concentrations of chemical or radioactive materials	Well below harmful levels; negligible impacts on vegetation and wildlife.	Same as Location A	Same as Location A	Potential for adverse impacts to aquatic biota associated with cylinder yard runoff during painting activities.	Potential for adverse impacts to aquatic biota associated with cylinder yard runoff during painting activities.
Wetlands	Potential direct and indirect impacts to wetlands from facility construction; impacts could be minimized by facility placement.	No direct impacts to wetlands. Possible indirect impacts to nearby wetlands.	Similar to Location B	Negligible impacts	Negligible impacts

TABLE S-6 (Cont.)

	Proposed Action			No Action	
Environmental Consequence	Location A (Preferred)	Location B	Location C	at Portsmouth	at ETTP
Threatened or endangered species	No direct impacts from construction or operations; destruction of trees with exfoliating bark could indirectly impact the Indiana bat by destroying roosting habitat.	No direct or indirect impacts from construction or operations.	Similar to Location A	Negligible impacts	Negligible impacts
		Waste Management			
Construction	Minimal impacts to site waste management capabilities from construction-generated waste.	Same as Location A	Same as Location A	NA	NA
Operations	Negligible impacts to site management capabilities from low-level radioactive waste (LLW) and hazardous waste generation.	Same as Location A	Same as Location A	No impacts from LLW or low-level radioactive mixed waste (LLMW) generation; both would generate less than 1% of annual site totals for each.	No impacts from LLW or LLMW generation; both would generate less than 1% of annual site totals for each.

TABLE S-6 (Cont.)

	Proposed Action			No Action	
Environmental Consequence	Location A (Preferred)	Location B	Location C	at Portsmouth	at ETTP
Operations (Cont.)	The triuranium octaoxide (U_3O_8) produced would generate about 4,700 yd^3 (3,570 m^3)/yr of LLW. This is 5% of Portsmouth's annual projected volume; low impact on site LLW management. If HF is neutralized to CaF_2, generation of about 3,745 yd^3/yr (2,860 m^3/yr) of CaF_2. Generation of TRU waste is unlikely under current proposals.				
Resource Requirements[h]					
Construction and operations	No effects on local, regional, or national availability of materials required for construction or operations are expected.	Same as Location A	Same as Location A	No effects on local, regional, or national availability of mate-rials are expected.	No effects on local, regional, or national availability of mate-rials are expected.

TABLE S-6 (Cont.)

	Proposed Action			No Action	
Environmental Consequence	Location A (Preferred)	Location B	Location C	at Portsmouth	at ETTP
		Land Use			
Construction and operations	Up to 65 acres (26 ha) would be disturbed for construction of the conversion facility, with 10 acres (4 ha) permanently altered. Up to an additional 6.3 acres (2.5 ha) would be required for construction of a new cylinder yard. The permanently altered areas represent about 1% of available land already developed for industrial purposes, resulting in negligible impacts to land use.	Same as Location A	Same as Location A	No impacts	No impacts
		Cultural Resources			
Construction and operations	Impacts to cultural resources are possible; archaeological and architectural surveys have not been finalized and must be completed prior to initiation of the proposed action.	Same as Location A	Same as Location A	Impacts would be unlikely because storage yards are located in previously disturbed areas already dedicated to cylinder storage.	Impacts would be unlikely because storage yards are located in previously disturbed areas already dedicated to cylinder storage.

TABLE S-6 (Cont.)

	Proposed Action			No Action	
Environmental Consequence	Location A (Preferred)	Location B	Location C	at Portsmouth	at ETTP
	Environmental Justice				
Construction and operations	No disproportionately high and adverse impacts to minority or low-income populations in the general public during normal operations or from accidents.	Same as Location A	Same as Location A	No disproportionately high and adverse impacts to minority or low-income populations in the general public during normal operations or from accidents.	No disproportionately high and adverse impacts to minority or low-income populations in the general public during normal operations or from accidents.
	Conversion of ETTP Cylinders at Portsmouth				
Cylinder preparation					
Location of cylinder preparation activities	ETTP: approximately 6,400 ETTP cylinders prepared for shipment to Portsmouth.	Same as Location A	Same as Location A	NA	NA
Impacts from using cylinder overpacks	No facility construction required; operational impacts limited to external radiation exposure of involved workers; total collective dose to the worker population of 69 to 85 person-rem at ETTP, with no LCFs expected.	Same as Location A	Same as Location A	NA	NA

TABLE S-6 (Cont.)

	Proposed Action			No Action	
Environmental Consequence	Location A (Preferred)	Location B	Location C	at Portsmouth	at ETTP
Impacts from using cylinder transfer facility	Construction of a transfer facility would be required at ETTP. Operational impacts would generally be small and limited primarily to external radiation exposure of involved workers; total collective dose to the worker population of 440 to 480 person-rem at ETTP, with no LCFs expected.	Same as Location A	Same as Location A	NA	NA
Operations if ETTP cylinders are transported to Paducah (option)	If ETTP cylinders were transported to Paducah, the operational period of the Portsmouth conversion plant would be reduced by about 4 years. Annual impacts would be the same, as discussed for each technical discipline. No significant decrease in overall impacts.	Same as Location A	Same as Location A	NA	NA

TABLE S-6 (Cont.)

	Proposed Action			No Action	
Environmental Consequence	Location A (Preferred)	Location B	Location C	at Portsmouth	at ETTP
	Decontamination and Decommissioning				
Activities involved	Disassembly and removal of all radioactive and hazardous components, equipment, and structures, with the objective of completely dismantling the various buildings and achieving greenfield (unrestricted use) conditions.	Same as Location A	Same as Location A	NA	NA
Human health and safety impacts	Decontamination and decommissioning (D&D) impacts primarily limited to external radiation exposure of involved workers; expected exposures would be a small fraction of operational doses; no LCFs expected. No fatalities from occupational accidents expected; up to 5 injuries.	Same as Location A	Same as Location A	NA	NA

TABLE S-6 (Cont.)

	Proposed Action			No Action	
Environmental Consequence	Location A (Preferred)	Location B	Location C	at Portsmouth	at ETTP
Other impacts	Generation of LLW, LLMW, and hazardous waste; approximately 90% of D&D materials generated are expected to be clean.	Same as Location A	Same as Location A	NA	NA
Impacts Associated with Conversion Product Sale					
Products potentially marketed	HF and/or CaF_2	Same as Location A	Same as Location A	NA	NA
Annual Portsmouth production	55% HF solution: 8,200 t/yr (9,000 tons/yr)	Same as Location A	Same as Location A	NA	NA
	CaF_2: 18 t/yr (20 tons/yr)	Same as Location A	Same as Location A	NA	NA
CaF_2 produced if HF is neutralized	8,800 t/yr (9,700 tons/yr)	Same as Location A	Same as Location A	NA	NA
Maximum estimated radiation dose to a worker from HF or CaF_2 use	<1 mrem/yr	Same as Location A	Same as Location A	NA	NA
Potential socioeconomic impacts from use	Negligible socioeconomic impacts	Same as Location A	Same as Location A	NA	NA

Footnotes on next page.

TABLE S-6 (Cont.)

[a] Potential environmental impacts are summarized and compared in this table for the no action alternative and the action alternatives. For the action alternatives, impacts are presented for the three alternative locations within the site; annual impacts are based on the assumption of an 18-year operational period. For the no action alternative, annual impacts are based on the assmption of a 40-year operational period.

[b] NA = not applicable.

[c] Chemical exposures for involved workers during normal operations were not estimated; the workplace environment would be monitored to ensure that airborne chemical concentrations were below applicable exposure limits.

[d] On the basis of calculations performed for this EIS, the accidents that are listed in this table have been found to have the highest consequences of all the accidents analyzed. In general, accidents that have lower probabilities have higher consequences.

[e] The ranges in accident impacts reflect differences in the possible atmospheric conditions at the time of the accident.

[f] In addition to noninvolved worker impacts, chemical and radiological exposures for involved workers under accident conditions (workers within 100 m [328 ft] of a release) would depend in part on specific circumstances of the accident. Involved EPA worker fatalities and injuries resulting from the accident initiator or the accident itself are possible.

[g] The guideline concentration used for comparison with estimated surface water and groundwater uranium concentrations is the former proposed EPA maximum concentration limit (MCL) of 20 µg/L; a revised value of 30 µg/L will become effective in December 2003. These values are applicable for water “at the tap” of the user and are not directly applicable for surface water or groundwater (no such standard exists). The guideline concentration used for comparison with estimated soil uranium concentrations is a health-based guideline value for residential settings of 230 µg/g.

[h] Resources evaluated include construction materials (e.g., concrete, steel, special coatings), fuel, electricity, process chemicals, and containers (e.g., drums and cylinders).